DOCTORAL THESIS

Scleroderma: the relationship of psychosocial stress and levels of compassion, to psychological injury, age of onset and severity of disease symptoms

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Scleroderma: The Relationship of Psychosocial Stress and Levels of Compassion, to Psychological Injury, Age of Onset and Severity of Disease Symptoms.

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Abstract

Scleroderma has been studied extensively with much known about onset and progression, and the relationship with psychological aspects such as coping, depression and anxiety. However, there is limited knowledge about how the development and progression of scleroderma is related to personal stress experienced at an early age (psychological injury) and the emotional regulation strategies such as self-compassion used to help in coping. This may be important information for the treatment of scleroderma and related illnesses. This thesis addressed this relationship over more than ten specific studies that examined how different forms of scleroderma (diffuse and limited sclerosis), different symptoms (such as Raynaud's phenomenon - the first sign of scleroderma onset) and age of onset were linked to psychosocial experiences; particularly examining stresses experienced, and levels of self-compassion or kindness to oneself (self-kindness). The research questions raised were whether psychosocial variables involving early interpersonal experiences (early life stress and insecure adult attachment) and emotion regulation strategies (levels of self-compassion and emotional suppression), would be related to physiological responses (levels of hyper-arousal) - in scleroderma symptoms and onset. A within groups and between groups design was utilized. Three major different samples were recruited to enable attention specifically and first, to individuals with scleroderma, and then, following the scleroderma studies and to enable comparisons, second, to individuals from a general community sample ('normal population'), and third and finally, to individuals with breast cancer. When comparing groups it was hypothesised that individuals from the scleroderma sample would report lower positive early life experiences and levels of self- compassion in their emotional regulation, than the community and breast cancer samples. Participants (129) in the first study were recruited from national and international scleroderma organisations and invited to complete either an online or hard copy survey. The findings supported the hypotheses and revealed that negative

nurturing experiences in childhood (low in early memories of warmth and safety: EMWS) predicted, elevated pain in scleroderma, depression and anxiety; and was significantly greater when comparing groups for those with more severe skin involvement (a general gauge of overall disease severity) and those with Raynaud's phenomenon, when compared to those without this condition. In addition in this first study (of scleroderma) insecure adult attachment with significant others also predicted elevated pain, and depression and greater skin severity when comparing levels of skin involvement. Difference between the major subsets of scleroderma (diffuse and limited sclerosis) were found for pain: with EMWS and dismissive attachment, being significantly related to elevated pain for limited sclerosis; whereas emotional suppression was significant for diffuse sclerosis. Emotional suppression an emotion regulation strategy was also significantly related to anxiety and greater skin severity when comparing levels of skin involvement. Hyper-arousal predicted more severe Raynaud's phenomenon, and was related to level of scleroderma disability, the early age diagnosis with scleroderma, and low self-compassion. Other relationships with attention to whether self-compassion helped as a strategy for coping with scleroderma, demonstrated that low self-compassion was significantly related to an earlier onset of scleroderma and Raynaud's (diagnosed up to decades before the onset of scleroderma itself) and predicted more severe Raynaud's symptoms. Low self-compassion (low self-kindness) and hyper-arousal (reactive) predicted more severe Raynaud's phenomenon for diffuse sclerosis; whereas greater self-judgment (a subscale of self-compassion) was significantly related to elevated Raynaud's for the limited sclerosis group. Results generally supported the hypotheses and demonstrated that early life stress involving experiences low in warmth and safety, an insecure attachment style, inadequate emotion regulation/coping strategies (low self-compassion and suppression) and hyper-arousal, predicted or were associated with psychological or physiological variables such as depression, anxiety, pain, scleroderma and Raynaud's symptoms and onset.

Participants in the second and third comparison studies completed an online or hard copy survey and were recruited through breast cancer organisations and community organisations such as sporting clubs; and also included university students. Community members mainly from South East Queensland totalling 106 people, were recruited for the community study. Breast cancer organisations from around the world were involved in seeking participants for the study with 31 involved in the final numbers. Results suggested similarities and differences between groups; with significantly greater early childhood stress and lower self-compassion reported by individuals diagnosed with scleroderma when compared to community participants and significantly lower self-compassion for scleroderma participants when compared to breast cancer participants. Some similarities were found between illness groups. For depression, low self-compassion was significant for both groups; however, lower EMWS (scleroderma) and dismissive attachment (breast cancer) also predicted depression for the respective groups. For anxiety, emotional suppression was a significant predictor in both the scleroderma and breast cancer groups; however, lower EMWS, elevated pain and hyper-arousal also predicted anxiety for the scleroderma group, but not the breast cancer sample. Demonstrating that EMWS was more likely to predict experiences of depression and anxiety for scleroderma participants than breast cancer participants. No other variables were significant for breast cancer. Findings generally supported the hypotheses and demonstrated that an inability to engage compassionate soothing emotion regulation experiences to reduce arousal, was likely to increase the vulnerability of scleroderma and breast cancer participants (to developing conditions such as depression).

Differences between those with scleroderma and breast cancer were also found for the variables that predicted age diagnosed with the illness. Greater hyper-arousal predicted an earlier onset of scleroderma; whereas greater self-compassion (which was predicted by low hyper-arousal) predicted a later diagnosis of breast cancer. Findings demonstrated a more

positive outcome for breast cancer participants who reported a greater capacity to engage in self-compassion as an emotion regulation strategy to reduce arousal; as results suggested this way of relating to the self was more likely to predict a later, rather than earlier onset of breast cancer. Conversely, low self-compassion was related to a diagnosis of Raynaud's phenomenon at a younger age for individuals diagnosed with scleroderma (first study); suggesting that levels of self-compassion (e.g., high: later onset of breast cancer; low: earlier onset of Raynaud's/scleroderma) may have consequences in relation to onset of disease. Greater early childhood stress and lower self-compassion were reported by scleroderma participants when compared to community participants and lower self-compassion was reported by scleroderma participants when compared to breast cancer participants; these experiences also predicted elevated pain, Raynaud's symptoms and earlier onset of Raynaud's phenomenon. Thus, in relation to scleroderma (the main focus of the study), these experiences are seen to impact on levels of arousal and the course of scleroderma, resulting in an earlier onset and exacerbation of symptoms. The findings suggest more beneficial results come from strategies that are related to lower arousal: such as greater experiences of self-compassion.

Limitations include a smaller sample size for the breast cancer group than anticipated. This occurred as breast cancer organisations expressed concerns about exploring members early childhood experiences due to factors related to blame for the development of the disease. Post-hoc calculations, however, indicated adequate power in the numbers involved, allowing for confidence in the comparisons made. Further research that involves identifying levels of self-compassion and hyper-arousal when people are first diagnosed with Raynaud's/ scleroderma and providing education and therapies that teach patients to engage in self-compassion and arousal reduction techniques; may provide beneficial outcomes in reducing symptomology and possibly leading to an extended life expectancy (as thirty per cent of individuals diagnosed with scleroderma die within the first five years of diagnosis).

The major contribution of this series of studies was the finding that greater self-compassion may be a determining factor in predicting lower hyper-arousal and a later onset of disease. This study demonstrates the importance of providing individuals (children) with adequate experiences of nurturing and feelings of safety and the development of effective emotion regulation strategies such as self-compassion to reduce negative arousal. Providing children with positive nurturing experiences and the capacity to engage in self-compassion may be a protective factor for reducing arousal and delaying the onset of disease.

Declaration

This thesis is submitted to Bond University in fulfilment of the requirements of the degree of Doctor of Philosophy. This PhD thesis represents my original work and I certify that all work in this thesis is my work unless cited otherwise. This thesis has not been previously submitted toward any other degree.

Karen Kearney

Date: / /

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CHAPTER ONE

Research Project Overview

Psychosocial stress is recognised as significantly contributing to the development of many psychological conditions and diseases (e.g., Ackerman et al., 2002; Arnetz & Ekman, 2006; Boscarino, 2004; Da Costa et al., 1999). The potential for stress to impact on an individual's physical health has long been known to depend on an individual's physiological response to the stressor (Selye, 1950; Seyle, 1976). A number of physiological systems such as the neuroendocrine and immune systems respond to psychosocial stress (Lekander, 2002; Maier & Watkins, 1998). Psychosocial stressors include interpersonal violence (e.g. Stein & Kennedy, 2001), attachment interactions that fail to reduce arousal (Bowlby, 1998; Schore, 2002) and cognitions and emotions associated with stress and distress (Lekander, 2002; Maier & Watkins, 1998). Individuals who lack the capacity to effectively manage stressful situations may as a consequence suffer from excessive arousal reactions (Selye, 1950; Seyle, 1976), augmented inflammatory responses, dysregulation of the immune system (Arnetz & Ekman, 2006) and psychological conditions such as depression and anxiety; experiences that are risk factors in the development of autoimmunity (e.g., Boscarino, 2004; Schore, 1994).

Although stressful experiences are common and can occur over the lifespan, early life stress may have long lasting detrimental effects on the developing limbic and immune systems; and an individual's capacity to adjust to adult stress situations and develop a secure attachment style (relationships with significant others). Negative appraisal of self and others can result from early stress events and can impact on psychological and social maturation that may lead to depression and anxiety disorders (e.g., Schore, 1994). For example, Briere (1995) identified a number of major psychological and physiological responses to childhood stress/abuse. These responses included anxiety, posttraumatic stress and hyper-arousal, cognitive distortions such as depression; altered emotionality, such as defensive avoidance

(an emotion regulation strategy that influences cognitions and behaviours); and impaired self-reference, such as a limited capacity to provide self-support.

Adverse childhood experiences have also been found to affect brain physiology by interfering with normal brain wave development. In this study higher levels of brain-wave abnormalities were found in individuals reporting early trauma when compared to those without trauma experiences (Teicher et al., 1997). Stress leads to arousal of a number of interrelated neurological systems (e.g., hypocampal-hypothalamic-pituitary-adrenal axis) and when severe, repeated or prolonged, the neurological systems involved in the stress response may become dysregulated (Van der Kolk & Greenberg, 1987). Dysregulation of neurological processes resulting from stress can involve immunological responses and excessive inflammatory reactions (e.g., Crittenden & Claussen, 2000; Van der Kolk & Greenberg, 1987), involved in autoimmunity (e.g., Schore, 1994) and the development of scleroderma (Bolster & Silver, 2008).

When individuals are exposed to an early life deprived of warmth and safety, they tend to lack experiences of positive affect and compassion. Gilbert and colleagues suggest that these experience's result in the infrequent activation of the soothing/safety system and the capacity of an individual to self-sooth and effectively regulate emotions (Gilbert et al., 2008). Gilbert suggests there are a number of emotion regulation systems, which include the soothing/safety system and the threat/protection system. Limited exposure to positive nurturing experiences and few early life experiences of feeling safe are likely to stimulate the threat system and develop a tendency to view others as potentially threatening (Gilbert, 2000; Gilbert, Clarke, Hempel, Miles, & Irons, 2004; Gilbert et al., 2008).

These strategies condition the individual to utilize a range of negative emotional, cognitive and behavioural approaches that are self-critical and more likely to result in the development of defensive strategies (Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006; Gilbert,

McEwan, Mitra, Franks, & Richter, 2008) such as avoidance behaviours and emotion suppression (Gross, 2002), to prevent engaging in the threat situation (Langens & Morth, 2003). Researchers have identified a number of variables that suggest individuals with scleroderma have a tendency to view others as threatening and engage in avoidance behaviours. Behaviours such as defensiveness, interpersonal sensitivity (Angelopoulos et al., 2001), fear of negative evaluation and social anxiety (Richards et al., 2004) have been reported in a number of scleroderma studies. These behaviours suggest individuals with scleroderma may be hyper-sensitive to threat and may utilize avoidant emotion regulation strategies such as suppression to manage threatening experiences, factors yet to be investigated and therefore explored in the current study.

Gilbert's social mentalities theory suggests that individuals who function in the "threat mentality" tend to have experienced critical early environments deficient in compassion. Gilbert (e.g., 2000; 2002) postulated that in the absence of compassionate soothing experiences the internalisation of these early external threat experiences, may impede the development of the self-soothing social mentality. This may lead to an inability to self-sooth and use effective emotion regulation strategies to manage distress. Engaging defensive strategies to avoid internal and external threat experiences may increase self-critical cognitions (Gilbert et al., 2004; Gilbert et al., 2006; Irons et al., 2006), susceptibility to conditions such as anxiety and depression (Gilbert, 2007; Gilbert, 2012) and physiological responses such as increased sympathetic nervous system activation (Campbell-Sills, Barlow, Brown, & Hofmann, 2006) and immune dysregulation (Schore, 1994). Experiences involving threat and the capacity to reduce arousal, through the utilization of effective emotion regulation strategies have been under-investigated in relation to scleroderma (a complex autoimmune disease). To determine the relationship between these psychosocial factors and immune related symptoms, the current research project investigated negative early life experiences, levels of self-compassion,

emotion suppression and hyper-arousal, and scleroderma onset and symptoms.

Gilbert's social mentalities theory (e.g., 2000; 2012) examines interactions between biopsychosocial and evolutionary adaption to threat and safety in social relationships. Gilbert suggests these interactions have the capacity to influence cognitive, emotional, motivational and behavioural development and involve evaluating potential threat, creating safe environments and regulating emotions associated with feeling safe or threatened. Gilbert (2002) suggested that inner compassion and the ability to self-sooth are strategies capable of down regulating the threat system and are generally developed through early nurturing experiences that engender feelings of warmth and safety. Gilbert's theory describes processes involved in the development of either beneficial or detrimental approaches to regulating the threat response and was utilized in this thesis project as a basis for exploring early threat experiences, emotion regulation and the relationship with immune related symptoms, particularly scleroderma.

Psychosocial stress is widely acknowledged as being associated with the onset and/or exacerbation of many immune related conditions such as breast cancer (Luecken, Dausch, Gulla, Hong, & Compas, 2004; Palesh et al., 2007) and autoimmune diseases; for example Crohns' disease (Garret, Brantley, Jones, & McNight, 1991), systemic lupus erythematosus (Da Costa et al., 1999; Pawlak et al., 2003), multiple sclerosis (Ackerman et al., 2002), hypothyroidism, rheumatoid arthritis, psoriasis (Boscarino, 2004) and scleroderma (Chen, Huang, Qiang, Wang, & Han, 2008; Hui, Johnston, Brodsky, Tafur, & Ho, 2007).

Autoimmunity occurs when the bodily processes responsible for differentiating between the self and pathogens fail to perform this function, damaging healthy tissue. Scleroderma (also known as systemic sclerosis) is described as a multistage, multisystem, chronic autoimmune disease that is characterised by progressive vascular disorder, immune activation and extreme tissue fibrosis (Smith & Kalhaleh, 2008). This disease develops when an individual's immune

system attacks healthy tissue impeding normal functioning of the skin, joints, blood vessels, lungs and internal organs (e.g., Etkins, Lenker, & Mills, 2005; Varga, 2004). Despite research that has been conducted in this area, there remains no known cause for scleroderma and only a limited understanding of the factors that may contribute to the development of this disease (e.g., Etkins et al., 2005). There is as a consequence no known cure and although stress is reported as a risk in the development of autoimmunity
(e.g., Boscarino, 2004; Schore, 1994), a paucity of research has been conducted with regard to stress and scleroderma. Therefore the current study explored stress from a threat-arousal-management perspective and the relationship to immune related symptoms in scleroderma.

Researchers have focused mostly on psychological factors in relation to aspects of the disease such as pain, coping with and adjustment to scleroderma, body image satisfaction and illness perception (e.g., Angelopoulos, Drosos, & Moutsopoulos, 2001; Richards, Herrick, Griffin, Gwilliam, & Fortune, 2004; Roca, Wigley, & White, 1996); with a few studies demonstrating an association between physical and emotional stress (Freedman & Ianni, 1983; Hui et al., 2007) and stress events occurring before scleroderma onset (Chen et al., 2008; Hui et al., 2007); however, these events were not examined in relation to disease symptoms. Therefore the current study investigated the relationship between biopsychosocial stress aspects and the onset of scleroderma. Factors associated with experiences of stress and threat including early life experiences and the ensuing physiological, cognitive and emotional responses, such as hyper-arousal, emotion regulation strategies (suppression and self-compassion) and insecure attachment styles (dismissive and fearful) have not previously been examined in relation to scleroderma symptoms and onset. Stress/threat experiences have the capacity to impact on an individual's physical and psychological health (e.g., Bowlby, 1998; Every & Lating, 2002; Gilbert, 2012; Gross, 2002; Neff, Kilpatrick, & Rude, 2007); and were therefore explored further in the current study in relation to scleroderma.

Aims and Proposed Methodology

The literature suggests that psychosocial stress has the potential to influence the development of many physiological and psychological conditions (e.g., Ackerman et al., 2002; Arnetz & Ekman, 2006; Boscarino, 2004; Da Costa et al., 1999). This potential is generally dependent on an individual's capacity to manage stress through early relational experiences (e.g., Gilbert, 2006; Gilbert, 2012), that promote the capacity to develop positive relationships with self and others and experiences that foster effective regulation of emotions and arousal reactions (e.g., Gilbert, 2002: Neff, 2003a). The development of chronic arousal reactions involve inflammatory responses, limbic and immune system dysregulation (Arnetz & Ekman, 2006); risk factors in autoimmunity (e.g., Boscarino, 2004; Schore, 1994), the development of Scleroderma (Bolster & Silver, 2008) and mental health conditions (e.g., Boscarino, 2004). Despite biopsychosocial research that has been conducted in relation to scleroderma, there remains no known cause or cure and only a limited understanding of the factors that may contribute to the development of this disease (e.g., Etkins et al., 2005). The focus on stress-arousal as a factor that may precipitate or exacerbate symptoms has not been explored in scleroderma research and requires investigation.

Stress-arousal and disease research demonstrate a link between early relational experiences and an individual's capacity to manage the psychological and physiological reactions involved in managing threat experiences. Stressful interpersonal and intrapersonal relationships that have the potential to elevate arousal, as well as factors previously explored in scleroderma studies were drawn on to develop the hypotheses for the current study. Findings from a number of scleroderma studies have identified behaviours such as defensiveness, interpersonal sensitivity, fear of negative evaluation and social anxiety. These studies did not identify significant factors from a stress-threat-arousal perspective or suggest that individuals with scleroderma have a tendency to view others as threatening. Conclusions drawn from these

studies generally referred to psychopathology when discussing findings. Drawing on these studies it was hypothesised that these fear related defensive behaviours suggest individuals diagnosed with scleroderma may be hyper-sensitive to threat and respond with protective-defensive-threat-arousal, in stress situations involving interpersonal and intrapersonal communications, ways of relating to self and others, that may have developed in early childhood. As the development of effective emotion regulation strategies that reduce arousal may be dependent on positive nurturing experiences in early life; it was hypothesised that negative early relational experiences deficient in compassion and safety and the utilization of ineffective emotion regulation strategies associated with increased arousal and immune dysregulation, would be related to onset and severity of scleroderma and mental health symptoms. Negative relating to self and others is likely to initiate the stress-arousal response for extended periods of time, increasing the risk of autoimmunity, and is therefore explored in this study in relation to scleroderma.

Three main studies and several sub-studies were conducted on scleroderma, breast cancer and community samples. The first (scleroderma) study investigated stressful interpersonal (early life experiences and adult attachment style) and scleroderma symptoms and onset. Intrapersonal relationships (how an individual relates to self and regulates emotions: levels of self-compassion and suppression of fear/threat experiences), elevated arousal (hyper-arousal) and the relationship to scleroderma symptoms and onset. Mental health (depression and anxiety) was also examined as the psychosocial variables in this study had not previously been explored in relation to these conditions; and may provide further understanding of the contribution these factors as well as the level of scleroderma disease symptoms experienced, have on levels of depression and anxiety experienced by this population.

Several theoretical models were examined in relation to the studies. The biopsychosocial model of health integrating aspects related to the area of

psychoneuroimmunology, Gilbert's biopsychosocial theory of social mentalities and model of affect regulation systems (such as threat/protection and soothing/safeness systems; e.g., Gilbert, 2000; Gilbert, 2001; Gilbert, 2002; Gilbert, 2012) were chosen and utilized in the thesis project to capture the relationships of the variables under investigation.

Types of Scleroderma - DV's and Psychosocial - IV's: The dependent variables for the first study were scleroderma, the different types of scleroderma (diffuse and limited sclerosis), defined by different antibodies with the more severe form of scleroderma, diffuse sclerosis involving a more rapid onset than the limited form of the disease (Bolster & Silver, 2008). These major forms of the disease involve symptoms such as Raynaud's phenomenon, breathing and intestinal conditions, ulcers, skin thickening, disability and pain. These variables as well as age of disease onset were investigated in relation to the independent psychosocial variables; early relational experiences of warmth and safety (EMWS), attachment style (e.g., dismissive and fearful); emotion regulation strategies, suppression/re-appraisal and self-compassion (self-kindness, mindfulness, self-judgement, isolation, over-identification), hyper-arousal; and depression, anxiety and stress to determine the relationship between these variables and the onset and exacerbation (and in the case of greater EMWS and self-compassion and lower insecure attachment and suppression, hyper-arousal: lower symptomology) of symptoms.

The second and third studies examined participants with scleroderma (autoimmune disease), breast cancer (depressed immunity) and a sample of 'normal' community and compared the relationship between the independent psychosocial variables investigated in the first study, and the dependant variables; (study two) scleroderma/community and (study three) scleroderma/breast cancer; and all groups scleroderma/breast cancer/community. Breast cancer was selected as a comparison group as it is more commonly diagnosed in women than men and is an immune related disease. The community group was selected as a comparison

study to ascertain whether differences occurred in psychosocial experiences between illness and non-illness groups (dependant variable: immune disease/no disease). The three groups were examined to determine the influence certain experiences may have on psychological and physical health conditions in these populations.

Review of the Literature - Disease and Stress

The Biopsychosocial Model, Psychoneuroimmunology and Psycho-oncology

The biopsychosocial model of health integrating psychoneuroimmunology, provides a framework to investigate emotion regulation and the social, psychological and immune related biological factors explored in the current study. The biopsychosocial model proposes that an individual's health is not only affected by physiological factors but also social and psychological aspects (Barlow & Durand, 1999). This model adds a social and psychological aspect to the biomedical model (described as the conventional model of health).

Historical Context: Physical and Psychological Health Models

The biomedical model of health and illness that has prevailed since the 19th century, suggests a purely physiological understanding of the body's processes, with molecular biology utilized to explain disease and physical health. The biomedical model assumes that health relating to the physical aspects of the body is independent of the psychological and social aspects of the mind. Although psychological and social factors were not integrated into the biomedical model of health, Psychosomatic Medicine (in the 1930's), Behavioural Medicine and Health Psychology (in the 1970's), recognised the interrelationships between physical and psychosocial aspects of illness (Sarafino, 2008).

The expanded and more holistic view of health and behaviour resulted in the development of a framework that included the biomedical and psychosocial aspects of health, referred to as the biopsychosocial model. The biopsychosocial model recognises that any particular disease or disorder is complex and therefore is unlikely to be attributable to a single

factor, providing a framework to understand the physiological, social, psychological, and behavioural dimensions of illness, as interacting to influence behaviour and health. The biological dimension of the biopsychosocial model considers aspects such as the functioning and interrelationships of physiological systems and gene expression. Psychological aspects of this model involve mental processes and behavioural factors that involve cognitions, emotions and motivation. Social factors include interpersonal and societal influences on health that involve the family, general community and the larger society (Sarafino, 2008). As research increasingly found that emotions affected the endocrine and immune systems, a new field emerged (psychoneuroimmunology) that specifically studied the interrelationship of emotions, the endocrine and immune systems (Sarafino, 2008). Psychoneuroimmunology (PNI) is a field that examines biological processes involving the neural, endocrine and immune systems in relation to disease and psychological conditions. This area of research is interested in the bidirectional interactions between human behaviour and neural, endocrine and immune processes, based on the theory first postulated by George Solomon in1964, termed psychoimmunology (Kern & Ziemssen, 2008). This theory explores the influence of emotions in relation to immunity and disease and suggests that immune related changes affect the physical body as well as cognitions, emotions, motivation and behaviour (Lekander, 2002; Maier & Watkins, 1998).

Scleroderma and Psychoneuroimmunology (PNI): PNI views stressful experiences and emotional states as factors that have the potential to influence physiological systems. PNI is concerned with the hypothalamus-pituitary-adrenal (HPA) axis, an endocrine system that responds to physical and psychological stressors. These stressors may potentially initiate a stress response that involves the release of hormones from the hypothalamus and pituitary gland, including adrenocorticotropic hormone (ACTH) and cortisol. The autonomic nervous system (ANS) is also involved in the stress response and communicates with the immune

system. The HPA axis, the ANS and immune system are influenced by psychosocial factors, particularly positive and negative emotions (Kern & Ziemssen, 2008); for example stress and depression from stressful life events have the potential to impair the immune function (Marsland, Cohen, Rabin, & Manuck, 2001) and are factors associated with scleroderma (Roca et al., 1996; Angelopoulos et al., 2001; Hui et al., 2007); however, there are gaps in the knowledge. Therefore scleroderma symptoms (immune dysregulation), such as Raynaud's phenomenon and gastrointestinal dysfunction and psychosocial variables such as early life stress, emotion regulation, depression and anxiety were investigated in the current study to determine the relationship between psychosocial variables and immune related symptoms.

Scleroderma and Psychosomatic Dermatology: Scleroderma is predominately a connective tissue disease involving the skin. Psychosomatic dermatology recognises the biopsychosocial aspect of skin disorders such as psychosocial variables that involve intrapersonal and interpersonal relationships that may influence skin disorders (Gieler, Niemeier, Kupfer, & Harth, 2008). Skin conditions are experienced by a majority of individuals diagnosed with scleroderma.

The relationship between interpersonal and intrapersonal psychosocial stress factors and skin related conditions have not previously been investigated in relation to scleroderma and were explored in the current study to determine this relationship.

Cancer and Psychosocial Aspects: The current study also examined cancer as a comparison and contrast to scleroderma issues. The scientific field established to explore the role biopsychosocial factors may play in the onset or exacerbation of cancer symptoms is called psycho-oncology. This field was established in the mid nineteen-seventies when it became apparent that psychological, social and biological aspects contributed to the cancer experience; and cancer had become de-stigmatised to a level that the emotional affects experienced by a person diagnosed with cancer could be discussed and investigated. Psycho-

oncology developed as a field that conducts research related to the psychological aspects of cancer, including behavioural and lifestyle factors and the management of symptoms related to the development of cancer such as anxiety, depression, pain and fatigue (Holland, 1998).

Psychoneuroimmunology also contributes to cancer research through the investigation of connections between psychological and physiological aspects of cancer risk and survival (Holland, 2002). Psychosocial factors such as anxiety, depression, attachment style and emotion regulation strategies explored in the scleroderma sample (over-responsive immune system) were also examined in individuals diagnosed with breast cancer (depressed immune system) to determine whether differences and/or similarities occurred in the relationship between psychosocial variables and immune related symptoms for these groups.

Biopsychosocial Aspects of Stress

Biologically stress can involve a number of the body's systems including the central nervous, endocrine, and immune systems and can create an abrupt and intense disruption to the body's homeostasis (Kusnecov & Rabin, 1994). Psychologically defined stress refers to the evaluation of any particular circumstance as exceeding the capacity of an individual to manage an event that may potentially endanger their well-being (Lazarus & Folkman, 1984). Physical or psychological stimuli that exceed an individual's available internal and external resources and capable of generating a stress response are described as stressors (Lazarus & Folkman, 1984; Selye, 1950; Seyle, 1976). External and internal stressors have the potential to injure or impair the biological, psychological and social systems of an individual. External stressors resulting from environmental and psychosocial stress and internal stressors such as inflammatory responses (a symptom of scleroderma), are therefore capable of disturbing the body's equilibrium (Schore, 1994).

Not all stressors elicit the same (physiological, behavioural or psychological) response and the same stimulus generally has a different effect on each individual due to genetic

predispositions, age and gender or exposure to environmental factors (e.g., Chapel, Haeney, Misbah, & Snowden, 2006; Selye, 1950; Seyle, 1976). It has been understood for some time that exposure to stressors and predisposing characteristics may result in inadequate physiological responses to stress; for example Selye's general adaption syndrome (GAS). Selye (1950; 1976) described three stages of adaption to stress, with each stage eliciting changes in the functioning of the nervous and endocrine systems. The first stage, the alarm reaction stage, involves the release of hormones that assists in increasing resistance to the stressor and is followed by the resistance and exhaustion stages. Conditioning factors involving internal and external factors that differ amongst individuals may considerably alter the stress response pattern and the ability to adapt to or tolerate stress; a situation that may be a determining factor in the development of disease (Selye, 1950; Seyle, 1976). As the literature suggests differences occur in individual responses to stress, the current study explored differences in biopsychosocial factors in individuals diagnosed with scleroderma and the relationship between these factors.

The development of arousal conditions generally result from an individual's inappropriate response to indirect stressors (e.g., Every & Lating, 2002). Arousal is influenced by genetic factors and is higher in individuals who are more physiologically and emotionally reactive (Pfaff, 2005). Several systems are responsible for controlling the human stress response; these include the sympathetic component of the autonomic nervous system (SAM) and the hyperthalmic-pituitary-adrenal (HPA) complex. The pituitary gland is controlled by the hypothalamus and excretes a number of hormones that are released when an individual is stressed, for example corticotropin-releasing factor (CRF) excreted by the hypothalamus signals the pituitary to release the hormone ACTH that activates the adrenals. A number of hormones such as serotonin, prolactin, oxytocin and beta-endorphines are involved in the anti-stress system that increases an individual's stress tolerance. When the anti-stress system is

effective the individual experiences a state of calm and relaxation and an increase in positive social interactions. Strategies that provide an individual with the capacity to self-sooth and reduce the stress response were investigated in the current study. Self-compassion strategies were explored in relation to psychosocial and biological symptoms of scleroderma to determine positive and negative effects of individual strategies for managing stress in the form of emotion regulation on physical and psychological well-being.

A number of situations that an individual may perceive as painful, threatening, overwhelming or that trigger unpleasant memories may activate the stress response. Excessive production of stress hormones can trigger excessive production of anti-stress hormones and may create health risks; for example excessive excretion of corticotrophin may trigger high levels of prolactin secretion associated with the development of pituitary adenomas (e.g., Arntez & Ekman, 2006) a condition associated with scleroderma (e.g., La Montagna et al., 2001). A few studies have reported elevated prolactin levels in women diagnosed with scleroderma (Kucharz, Jarlzyk, Jonderko, Rubizs-Brzezinska, & BrzezinskaWcislo, 1996; La Montagna et al., 2001). Vera-Lastra and colleagues (2006) identified 80% of scleroderma participants compared to 5% of controls with prolactin related conditions such as hyperprolactinemia, increased central dopaminergic tone and pituitary microadenomas, suggesting that prolactin may be involved in the prognosis of scleroderma (Vera-Lastra, Jara, & Medina, 2006). Prolactin performs a number of physiological functions including immunostimulation (Vera-Lastra et al., 2006) and its secretion has been associated with psychosocial factors (Fava, Fava, Kellner, Serafini, & Mastrogiacomo, 1981). Therefore investigating psychosocial factors that may be linked to pituitary adenomas (e.g., Arntez & Ekman, 2006) associated with the development of scleroderma (e.g., La Montagna et al., 2001) may provide further understanding of the role stress plays in scleroderma.

Prolactin concentrations may be influenced by stressful environmental conditions, as

prolactinomas often develop after stressful life events (Sobrinho et al., 1998) and were found to be more significant in uncontrolled stress events (Sonino et al., 2004). Variation in the secretion of prolactin affects the central nervous system, influencing an individual's emotions, mood and behaviour (Sobrinho et al., 1998; Sonino et al., 2004) and has been associated with negative experiences such as panic attacks (Fava, Serafini, De Besi, Adami, & Mastrogiacomo, 1988), rage associated with humiliating experiences (Sobrinho, 2003), parental separation (Assies, Vingerhoets, & Poppelaars, 1992), and parental deprivation in childhood (Sobrinho et al., 1998). Fava et al., (1981) found that elevated prolactin associated with hyperprolactinemia was related to depression and anxiety. Thus elevated prolactin is associated with stressful early relational experiences and mental health and is also a precursor to the development of scleroderma; however, the relation to early life stress and negative interpersonal and intrapersonal experiences had not previously been explored.

Therefore, these variables (early life stress and negative interpersonal and intrapersonal experiences) were investigated in relation to scleroderma, and depression and anxiety to determine the relationship between stress experiences, mental health and scleroderma symptoms. Further, stress related conditions include physiological diseases involving immunological responses and excessive inflammatory reactions, inadequate emotion regulation strategies that create hyper-arousal (e.g. Van der Kolk & Greenberg, 1987; Crittenden & Claussen, 2000), immune dysfunction; the development of illness conditions such as autoimmune diseases (e.g., Schore, 1994) and psychological disorders such as anxiety and depression (e.g., Miller, 2005; Every & Lating, 2002). However, little research has investigated stress related psychosocial variables such as ineffective emotion regulation strategies that increase arousal and physiological responses; these were examined in the current study to determine the relationship and contribution of these experiences to the autoimmune symptoms of scleroderma.

The Immune System: Depression and Anxiety

Stress induced depression may also affect the immune system by activating biological mechanisms that increase cytokine secretion and hyperactivity of the HPA-axis (e.g., Kiecolt, Glaser & Glaser, 2002). Anxiety and depression have been associated with a number of diseases including scleroderma and breast cancer (scleroderma, e.g., Angelopoulos et al., 2001; Beretta et al., 2006; Roca et al., 1996; breast cancer, Iwamitsu et al., 2005; Khan et al., 2012 and Vardanima et al., 2010) and are often preceded by stressful events and immune dysfunction (e.g., Boscarino, 2004; Miller, 2005). Research exploring depression and anxiety in scleroderma populations, has not previously examined the relationship between these mental health factors and the utilization of protective factors for managing psychosocial stress. Levels of self-compassion and positive/negative childhood rearing experiences, the quality of attachment relationships and the utilization of effective/non-effective emotion regulation/coping strategies were explored to determine the contribution these variables may have on disease symptoms.

The Immune System: Hyper-arousal

As stress may negatively impact on biological, psychological and social aspects of an individual's wellbeing, exposure to prolonged psychosocial stress can create hyper-arousal, heightening neuro-immune and endocrine activation, that may result in the development of physiological conditions such as autoimmune disease (e.g., Schore, 1994) and psychological conditions that involve emotion dysregulation (e.g., Van der Kolk & Greenberg, 1987; Crittenden & Claussen, 2000), such as anxiety and depression (e.g., Miller, 2005; Every & Lating, 2002). Stressors, such as emotional, immunological and inflammatory responses may produce excessive arousal reactions dependant on the intensity of the individual's response to the stressor (e.g., Every & Lating, 2002; Selye, 1976). The inability to adapt to stressful situations may produce excessive arousal reactions (Selye, 1950; 1976), dysregulation of the

immune system and augmented inflammatory responses (Arnetz & Ekman, 2006); risk factors in the development of diseases involving autoimmunity (e.g., Schore, 1994; Selye, 1950; Seyle, 1976) and symptoms associated with scleroderma (Bolster & Silver, 2008; Freedman & Ianni, 1983).

As excessive arousal reactions (hyper-arousal) have not been explored in scleroderma-psychosocial research and is a risk factor involved in the (autoimmune) disease process, the current study examined the relationship between this factor and scleroderma symptoms and onset.

The Immune System: Scleroderma

The immune system is complex and therefore a comprehensive explanation of its function is beyond the scope of this paper. A brief description however is provided. The immune system is comprised of a collection of cells organized to protect the individual from infection. The immune system is designed to distinguish normal components of the body from foreign pathogens and therefore differentiation between the self and non-self, through a process involving the innate and adaptive immune systems. The innate system identifies signs of infection, while the adaptive immune system responds to these messages by producing cells that attach to pathogens to eradicate them from the body. The adaptive immune system contains specific memories of evolving antigens, generating a vast range of receptors that either retain or eliminate molecules depending on reactivity. Generally the immune system differentiates between the body's tissues and pathogens; however, this system may become hyper-reactive creating an environment where the immune system attacks healthy tissue producing autoimmunity. The adaptive immune system consists of T and B lymphocytes, antigen recognition and cell development. The T cell actions the appropriate immune response responsible for distinguishing the body's tissues from pathogens; while proteins found on the surface of activated B cells, dendritic cells, monocytes and macrophages are involved in

increasing the immune response (Kay & Anderson, 2008).

The immune system communicates with the brain through a bidirectional systemic network, in which the immune system alerts the brain to events occurring in the body (Maier & Watkins, 1998). Neuro-immune interactions involve communication between a number of substances, including hormones, neurotransmitters and cytokines (Lekander, 2002). Immune cell activation occurs in response to potential injury and functions to protect the body and promote recovering. The immune system is regulated by the neuro-endocrine system and responds not only to infectious agents and physiological threat but also to psychosocial stressors. Immune related changes therefore affect the physical body as well as cognitions, emotions, motivation and behaviour (Lekander, 2002; Maier & Watkins, 1998). Changes that involve dysregulation of the immune system have been implicated in psychological conditions such as depression and immune related diseases (Maier & Watkins 1998), such as scleroderma.

Therefore factors that may provide a protective function in relation to the immune system (scleroderma symptoms) and psychological conditions (e.g., depression) such as elements of self-compassion (e.g., self-kindness, and mindfulness), that may provide an individual with the capacity to return the body to a state of calm by reducing arousal, were examined to determine this relationship.

Scleroderma: Gastrointestinal Conditions

Gastrointestinal conditions have also been associated with autoimmune diseases such as scleroderma (Bolster & Silver, 2008) and psychosocial variables that include stress, anxiety and depression, (Nietert et al., 2005; Tache, Martinez, Million & Wang, 2001). Tache and colleagues suggested that stress can alter gastrointestinal functioning as part of the physiological response to stressors and that the brain is involved in mediating the inhibition of

the upper, and stimulation of the lower gastrointestinal system in response to stress. These physiological reactions to stress were also found to be associated with anxiety and depression (Tache et al., 2001) and were factors investigated in the current study.

Autoimmune Diseases and Psychosocial Stress

Research suggests autoimmune diseases such as scleroderma are the result of interactions between factors an individual encounters in the environment, such as experiences of stress and trauma and predisposing aspects, such as those involving a person's genetic makeup (e.g., Chapel et al., 2006). Psychosocial stress is associated with the onset and/or exacerbation of many autoimmune diseases (e.g. Ackerman et al., 2002; Matos-Santos et al., 2001; Pawlak et al., 2003). Research has found that systemic lupus erythematosus disability was associated with more experiences of stressful life events (Da Costa et al., 1999). Stressful life events were also experienced by individuals diagnosed with Graves' disease before onset (Matos-Santos et al., 2001). Boscarino (2004) found an association between the development of autoimmune diseases, such as hypothyroidism, rheumatoid arthritis and psoriasis in Vietnam veterans experiencing posttraumatic stress disorder (PTSD). Some studies have also found that stress was associated with scleroderma (Chen et al., 2008; Hui et al., 2007; participants experienced a number of stress events before onset of disease) and breast cancer (e.g., Dube et al., 2009); however, the relationship between scleroderma disease symptoms and stress was not examined in these studies and require investigation.

A study conducted in the USA investigated the effects of adverse childhood experiences (ACE) such as childhood physical, emotional, and sexual abuse. In this ACE study the total number of adverse experiences (ranging from zero to eight), measured cumulative childhood stress. The results demonstrated that as the number of traumatic events in childhood increased, the likelihood of being hospitalised with an autoimmune disease decades into adulthood increased; indicating the likelihood of biological impacts of early life stress on subsequent

inflammatory responses (Dube et al., 2009). Female participants in this study were found to have a 50% greater likelihood than men for hospitalization with a Th2 category autoimmune disease (such as scleroderma). Indicating that the number of traumatic events experienced in childhood may influence physiological processes such as inflammation involved in the development of autoimmunity. The influence early life experiences may have on the development of autoimmunity has been explored through the measurement of number of stress events experienced by individuals. The current study explored early life stress experiences and this relationship to scleroderma symptomology by measuring an individual's experiences of nurturing and feelings of safety. This way of exploring stress relies on the individual's response to experiences, rather than measuring exposure to an event that an individual may or may not have experienced as stressful or traumatic. Dube and colleagues concluded (from the ACE study) that experiencing multiple trauma or stress events in early life may impact on the developing brain and affect the limbic system, an area of the brain that responds to emotions. Frequent activation of the stress response on a young person's central nervous system, may contribute to the dysfunction of the immune system increasing the risk for developing an autoimmune disease (Dube et al., 2009).

The current study therefore investigated the relationship (not previously explored) between adverse childhood experiences investigated as early memories of warmth and safety and scleroderma symptoms. These variables were explored to determine the impact early life experiences may have had on the development and/or exacerbation of scleroderma symptoms.

Scleroderma

Scleroderma is a rare and complex autoimmune-connective tissue disease affecting approximately 1 in 4,000 in the population and more commonly diagnosed in women. It is a multistage, multisystem, chronic disease that affects the organs, musculoskeletal and vascular systems (LeRoy & Medsger, 2001; Varga, 2004). Scleroderma is generally diagnosed in people

aged between 30 to 50 years and has a mortality rate of approximately 30% within the first five years of diagnosis. Scleroderma is one of the most complex and least understood of all autoimmune diseases. Individuals are afflicted with a range of symptoms that differ across this population and include, Raynaud's phenomenon, skin hardening, intestinal conditions, breathing problems, internal organ involvement and pain (e.g., Etkin et al., 2005; Giuggioli, Manfredi, Colaci, & Ferri, 2010; Varga, 2004).

Categories of Scleroderma: Scleroderma can be categorised as localised, linear or generalised (e.g., Chapel et al., 2006). The generalised form is the most common type and contains two major subsets of scleroderma, diffuse systemic sclerosis is present in 35% of individuals diagnosed with scleroderma and limited systemic sclerosis affects 60% of individuals with scleroderma; other forms of scleroderma such as sine scleroderma, linear scleroderma and morphia are considerably less prevalent (Hinchcliff & Varga, 2008). Limited sclerosis also known as limited cutaneous disease or CREST syndrome (calcinosas, Raynaud's phenomenon, esophagal dysmolity, scleradactal and telangiectasias), is the most common type of scleroderma. Skin thickening of the fingers is a primary feature of scleroderma; the extent of skin thickening and pace of disease progression differentiates diffuse scleroderma from limited scleroderma (Bolster & Silver, 2008). Skin symptoms are a general gauge of overall severity of scleroderma symptoms (Steen & Medsgar, 2001). People diagnosed with limited sclerosis, do not necessarily meet the full criteria for CREST syndrome but exhibit skin thickening features that may appear on the face, fingers and forearms.

Diffuse sclerosis has a more rapid onset than the limited form of the disease; symptoms include swelling of the hands and legs, carpal tunnel arthritis, Raynaud's phenomenon and fatigue. Skin thickening is also a feature of diffuse scleroderma with rapid progression beginning in the extremities and advancing to the trunk early in the disease course. Both diffuse and limited scleroderma subsets have similar gastrointestinal disease and interstitial

lung fibrosis symptoms, these symptoms are present in those with anti-Scl-70 (an autoantibody used to determine diagnosis; Bolster & Silver, 2008).

The two major scleroderma-subsets are classified according to specific autoantibodies. The anti-topoisonerase or anti-Scl-70 and AntiRNA polymerase 111 are associated with diffuse scleroderma and the anticentromere antibody is present in limited scleroderma, with approximately 25% of this population also exhibiting the antitopoisonerase antibodies. The presence of anti-topoisonerase increases the risk of pulmonary interstitial fibrosis, renal crisis, cardiac involvement and poorer survival. AntiRNA polymerase 111 is an antibody specific to scleroderma and present in 28% of this population. It most commonly occurs in diffuse scleroderma, rarely in limited scleroderma and is associated with rapid skin progression and renal crisis. Survival rates are greater in this population than those with anti-Scl-70 (Smith & Kalhaleh, 2008).

African-Americans and a Choctaw Native American Tribe have higher prevalence rates and earlier onset of scleroderma than Caucasians, with the antibodies associated with more severe prognosis occurring more frequently in this population. Scleroderma has also been reported in Australian aborigines although a formal study has not been undertaken. Antibodies may represent the body's reaction to different triggers of the disease; however, the varying frequency of different antibodies suggests that ethnicity and genetics are likely to be factors involved in the pathogenesis of scleroderma (Steen, 2008).

Pathogenesis of Scleroderma

The pathogenesis of scleroderma is very complex; genetic variables influence collagen, vascular and immune function and are further complicated by environmental factors (Smith & Kalhaleh, 2008; Steen, 2008). Antibodies explain differences between presenting symptoms for different scleroderma subsets; however what initiates and perpetuates this disease is still unclear. Altered functioning of the endothelial cells and immune dysfunction has been

implicated in disease activity. Anti-endothelial antibodies are evident in 40-50% of the scleroderma population and have been found to positively correlate with pulmonary pressure and digital ulcers and negatively with pulmonary diffusion capacity (Smith & Kahaleh, 2008). Endothelial cells make up the inner lining of a blood vessel and interact with the circulation system to regulate mechanism such as immunological and inflammatory responses (Sumpio, Riley, & Dardik, 2002). Neural pathways control blood flow regulation and arterial pressure through sympathetic activation of blood vessels; constricting arteries and smaller arterioles. This action involves the chemicals norepinephrine, epinephrine and occurs during situations such as exercise and emotional stress. Endothelial cell dysfunction occurs in many immune related diseases (Sumpio et al., 2002). As emotional stress is involved in immune dysregulation, the current study examined interpersonal and intrapersonal emotional stress experiences, including childhood stress, attachment style and emotion regulation strategies (levels of self-compassion and suppression) and the relationship to scleroderma symptoms.

Scleroderma Symptoms: Raynaud's and Stress

Vascular abnormalities are the first symptom of scleroderma with Raynaud's phenomenon affecting approximately 95% of people diagnosed with scleroderma. Raynaud's phenomenon in individuals diagnosed with limited scleroderma may precede the inflammatory skin stage and other symptoms of the disease by many years or in some cases decades. The onset of Raynaud's phenomenon in diffuse scleroderma generally occurs shortly before or in conjunction with a diagnosis of scleroderma. Raynaud's phenomenon involves the constriction of blood vessels, resulting in arterial closure (Smith & Kahaleh, 2008) in the fingers and less frequently the toes and facial area. It is induced by cold or emotional stress (Bolster & Silver, 2008). Research by Freedman and Ianni (1983) suggests that individuals diagnosed with both scleroderma and Raynaud's are likely to experience heightened reactions to stress. Recurring and prolonged vascular constriction often leads to ulcers, gangrene and amputation. Vascular

complications are not confined to the peripheral areas of the body, internal organs are also involved. The kidneys are affected by vascular complications with renal crisis involved in changes to blood vessels which is an early feature of diffuse scleroderma, while pulmonary artery hypertension is present in limited scleroderma (Baker & Denton, 2008). As research suggests that emotional stress is involved in Raynaud's symptoms and that individuals who experience both scleroderma and Raynaud's phenomenon, experience a greater physiological response to stress; the current study explored early life stress experiences in relation to Raynaud's onset and the relationship between these factors and scleroderma. Determining the influence specific types of stress may have on the development and/or exacerbation of scleroderma disease symptoms, may inform therapeutic treatment involving the management of stress in this population, to reduce symptomology and improve quality of life.

Scleroderma Symptoms: Pulmonary/Breathing and Gastrointestinal Conditions

Pulmonary disease in scleroderma is the most common cause of death and generally includes pulmonary arterial hypertension (PAH; prevalence 12% Mukerjee et al., 2003) and/or intestinal lung disease (prevalence 75%: Bussone & Mouthon, 2011; Smith & Kahaleh, 2008). In a study in 2003 the three year survival rate for PAH was 56% (Mukerjee et al., 2003) and for pulmonary fibrosis, a study by Steen & Medsger in 2006 revealed the ten year survival rate at 67%. Fibrosis also features throughout the body and is the result of a build- up of extracellular matter such as collagens and fibros mater in the lower layer of the skin (dermis), heart, kidneys, lungs and gastrointestinal tract (Smith & Kahaleh, 2008). Gastrointestinal involvement is generally the first manifested scleroderma symptom after Raynaud's phenomenon and is present in most scleroderma patients. The whole gastrointestinal system may become involved resulting in conditions such as fibrosis, smooth muscle atrophy, gastroesophageal reflux, malabsorption, diarrhoea, constipation, nausea, abdominal pain, anorexia and weight loss (Bolster & Silver, 2008). Gastrointestinal conditions have been

associated with stress and research has shown that stress can alter gastrointestinal functioning as part of the physiological response to stressors. The brain is also involved in mediating the inhibition of the upper and stimulation of the lower gastrointestinal system in response to stress; these physiological reactions to stress are also associated with anxiety and depression (Tache et al., 2001). Gastrointestinal and breathing conditions have not been investigated in relation to psychosocial stress and scleroderma and were therefore investigated to determine the relationship between interpersonal (early life and attachment experiences) and intrapersonal stress (emotion regulation e.g., levels of self-compassion), mental health (depression and anxiety), biological responses to stress (hyper-arousal) and scleroderma symptoms. Whether some stress experiences were more likely to influence the onset or exacerbation of specific scleroderma symptoms when compared to other stress experiences were also investigated.

Scleroderma Symptoms: Skin and Musculoskeletal Involvement

Musculoskeletal involvement is frequently experienced by patients with scleroderma and may involve such conditions as arthritis, inflammation, fibrosis, joint flexion problems, tendon friction rubs and tendon sheath pain often resulting from fibrin and collagen deposits; limiting movement of the tendons. Generally the fingers, wrists, elbows, ankles and knees are affected by this condition (Bolster & Silver, 2008) and there is further complication of skin thickening. T to B cells are implicated in the disease with an increased ratio of CD4 to CD8 T cells. CD8 T cells occur in the lungs and CD4 T cells predominate in the skin (Smith & Kahaleh, 2008).

The skin tends to progress through three stages of change during the course of scleroderma, these include inflammation, skin fibrosis and skin softening. In the initial stage the hands and fingers become puffy, sweat and oil excretion is reduced resulting in dry, cracked skin, poor wound healing, and ulcers on the digits and joints. This stage may continue for months at which time skin thickening begins to occur. Once the inflammation has subsided,

a protracted skin fibrosis stage may occur. Thickening of the skin generally begins in the fingers and may progress to the elbows, from the toes to the knees and affects the face and neck in limited scleroderma. In diffuse scleroderma skin thickening may progress to the trunk and all areas of the arms and legs. The third stage involves a softening of the skin typically on the trunk and upper arms for the diffuse form (Bolster & Silver, 2008). The level of skin involvement is a general gauge of overall severity of scleroderma symptoms (Steen & Medsgar, 2001).

Therefore the relationship between psychosocial stress variables and severity of skin involvement needs to be investigated to determine whether specific interpersonal and intrapersonal stress experiences, influence the level of skin involvement and overall symptom severity in individuals diagnosed with scleroderma. The current study also examined these aspects.

Incidence of Scleroderma

The prevalence rates of scleroderma (also known as systemic sclerosis) vary considerably and are dependent on the time period, the disease definition of cases and the country in which the study was completed. Chifflot and colleagues (2008) completed a systematic literature review and reported prevalence rates of scleroderma from studies conducted between 1969, to 2006. These rates varied from seven people per million to approximately 500 per million and were higher in the United States of America (276 per million) and Australia (233 per million) and lower in France (158 per million) and England (88 per million). Similar to other connective tissue diseases, systemic sclerosis has a greater incidence in the female population with predominance of 3-5:1, and up to 14:1 in some populations. The female-to-male ratio is greatest in child bearing years. In the postmenopausal age range, the ratio is at its lowest, 2.4:1 and in children; girls develop the disease more frequently than boys. Age of onset generally occurs between 30 and 50 years, with a mean age

of onset occurring in Caucasian males at 44 years and 42 years of age in females (Chifflot, Fautrel, Sordet, Chatelus, & Sibilia, 2008).

Prevalence rates are similar for both the major subsets of scleroderma (limited and diffuse sclerosis), although patients with limited scleroderma are not usually diagnosed until 5-10 years after onset of symptoms (Chifflot et al., 2008). Family studies have shown an increased frequency of scleroderma in first-degree family members. Prevalence rates for biological relatives with scleroderma reported in the United States of America (USA) were found to be higher than prevalence rates in the general population. A study by Arnett and colleagues (2001) compared prevalence rates of scleroderma in the USA with that of first degree relatives; findings revealed that approximately 1.6% of families had members diagnosed with scleroderma, which was significantly higher than in the general population. These results suggest that having a first degree relative with scleroderma is a risk factor for developing scleroderma, although the absolute risk factor for any individual family member is less than 1% (Arnett et al., 2001). Therefore genetic factors may not be the greatest risk for developing scleroderma.

Stress factors such as emotion regulation strategies that effectively or ineffectively reduce stress, that may have resulted from early life experiences (factors explored in this study) may play a role in the development of scleroderma; through the frequent triggering of stress chemicals involved in autoimmunity. Stress experiences may not only impact on specific scleroderma symptoms but also on individual's experiences of pain resulting from scleroderma symptoms. Stress variables such as attachment style, emotion regulation and childhood stress require examination in the current study, as these factors have been associated with experiences of pain in other studies (e.g., Davies, Macfarlane, McBeth, Morriss, & Dickens, 2009; Thakkar & McCanne, 2000) and would provide further understanding as to the influence certain types of stress may have on pain, one of the major disease factors associated with scleroderma.

Scleroderma Pain and the Biopsychosocial Model

Pain is a common experience associated with scleroderma and is a predictor of level of physical functioning (Benrud-Larson et al., 2002), disability (Miller, Rehberger, Gunther, & Schmitt, 2012) and psychological factors such as depression (Benrud-Larson et al., 2002; Miller et al., 2012). Pain has been described by the International Association for the Study of Pain as an unpleasant physiological and emotional sensation that acts to protect the body from tissue damage (ISAP, 2012). The biopsychosocial model emphasises that pain is a multifaceted experience that may be explained by biological factors such as tissue damage, while acknowledging the influence of social and psychological aspects (Keefe, Porter, & Labban, 2006). Pain is a complex phenomenon and is acknowledged as a sensory, emotional and cognitive experience, as it involves attention and interpretation that occurs at a neurological level. Pain is more than a sensory experience as the association between tissue injury and the level of pain experienced is low. The extent to which tissue is damaged, is not necessarily an indicator of pain intensity (Lee-Chiong et al., 2010). As pain is recognized as a private experience that differs between individuals (Lee-Chiong, Gebhart, & Mattay, 2010); and as the amount of tissue damage isn't always related to the level of pain experienced; the current study examined the relationship between psychosocial stress variables and individual experiences of scleroderma pain, to determine the influence early life and attachment experiences and also emotion regulation strategies could have on scleroderma related pain.

Physiologically elevated or excessive experiences of pain may be the result of nociceptors that are sensitive to tissue damage and react to changes such as inflammation, a condition involved in scleroderma. This effect may create an over sensitivity to pain due to over stimulation or irritation, resulting in a lowering of the nociceptors' firing threshold, increasing the responsiveness to painful stimuli; and in some cases hypersensitivity to non-dangerous stimuli. These experiences activate reflexes in a number of structures including the spinal cord,

brainstem, cortex and limbic (or emotional) system. These experiences distort the relationship between the degree of tissue damage and the extent to which pain intensity is perceived by the individual (Lee-Chiong et al., 2010).

The emotional effects of pain have been associated with negative emotions such as depression, anxiety and anger (Tan, Jensen, Thornby, & Sloan, 2008). Burns (2006) found that emotional responses associated with muscle tension were linked to elevated pain. Pain related emotions were also found to influence perceptions of pain and physiological reactions to pain. Rainville and colleagues found that pain-related anger/frustration and sadness, a desire for relief from pain, decreases in perceived control of pain and increases in arousal levels were associated with elevated experiences of pain (Rainville, Boa, & Chretien, 2005). Pain is associated with many scleroderma symptoms such as those involving the skin and musculoskeletal system (Miller et al., 2012). Pain can become chronic for individuals suffering severe complications due to disease symptoms, such as Raynaud's phenomenon and skin ulcers that can become gangrenous requiring amputation and creating further disability (Giuggioli, Manfredi, Colaci, & Ferri, 2010). These conditions have also been linked to psychological problems such as depression (Benrud-Larson et al., 2002; Miller et al., 2012). Research exploring emotions in relation to how people experience pain in other illness populations has found a range of psychosocial variables associated with pain occurrence. Pain research has linked psychosocial factors such as insecure attachment, emotion regulation and childhood stress with experiences of pain.

Research suggests exposure to early life stress may influence an individual's developing brain, the capacity to regulate emotions and reduce arousal in stressful situations across the lifespan, pain thresholds and the immune system (Depue, & Morrone-Strupinsky, 2005; Heit, Graham, & Nemeroff, 1999; Schore, 1994). Early life stress including child abuse has been linked to heightened stress in adults, physical illness and pain. Research suggests

individuals exposed to childhood abuse experienced an increase in physical symptoms that include gastrointestinal, respiratory, muscular and other types of pain (Thakkar & McCanne, 2000) and a greater likelihood of developing serious health conditions such as an autoimmune disease, ulcers, cancer, heart disease or diabetes (Sachs-Ericsson, Blazer, Plant, & Arnow, 2005). Therefore the emotional aspects of pain in relation to the capacity to effectively regulate emotions that may be influenced by early life experiences are factors investigated in this study in relation to pain associated with scleroderma.

Further evidence that pain is influenced by early psychosocial stress was reported by a number of researchers. Jones and colleagues found a relationship between childhood physical and psychological adversity and chronic pain in adulthood when compared with individuals who were not exposed to these experiences (Jones, Power, & Macfarlane, 2009). Greater scores were also reported by individuals who had experienced childhood trauma in relation to severe pain when compared with individuals without these experiences (Dragkioti, Mavreas, Damigos, Kotrotsiou, & Gouva, 2011). Individuals with chronic pelvic pain who had experienced past abuse histories and utilized the emotion regulation strategy suppression of unwanted thoughts, were also likely to experience higher levels of pain (Thomas, MossMorris, & Faquhar, 2006). Emotion regulation and early life experiences associated with stressful attachment interactions have also been linked to pain reactions. The development of certain attachment styles associated with an inability to regulate stress and emotions has also been linked to an increased vulnerability to stress, pain and disease. For example, Davies, Macfarlane, McBeth, Morriss, and Dickens, 2009 found that insecure attachment styles, (preoccupied, fearful and dismissive) were associated with approximately twice the experience of chronic widespread pain as other types of attachment. McWilliams, Cox, and Enns (2000) found that individuals experiencing chronic pain due to arthritis and an insecure anxious attachment style reported greater pain intensity and disability (Martinez, Miro, Sanchez,

Mundo, & Martinez, 2012). Research suggests that increased pain is associated with a number of psychosocial stress experiences including regulating and expressing emotions, and also factors related to early relational experiences such as an insecure attachment style and childhood experiences of stress. However, these factors have not been explored in relation to scleroderma pain and disability and therefore, were examined in the current study.

Psychological Factors and Scleroderma

Scleroderma is not limited to the physiological aspects of disease; a number of studies have demonstrated a link between scleroderma and psychopathology (Angelopoulos et al., 2001; Richards et al., 2004; Roca et al., 1996). These studies suggest that people diagnosed with scleroderma tend to have a co-morbid psychological status, with depression the most studied (Angelopoulos et al., 2001; Roca et al., 1996; Thombs, Hudson, Taillefer, & Baron, 2008). These psychological conditions create an added burden for people facing adjustment to this disfiguring, debilitating and potentially fatal disease. Psychological conditions such as depression, anxiety (Legendre, Allanore, Ferrand, & Kahan, 2005), fear of negative evaluation, social anxiety (Richards et al., 2004) anxiety, somatisation, obsessive compulsive disorder, interpersonal sensitivity, guilt (Angelopoulos et al., 2001), hostility, defensiveness (Angelopoulos et al., 2001; Hyphantis et al., 2007), aggression (Hui et al., 2007), self-blame and limited social support (Malcarne & Greenbergs 1995), have all been examined in relation to scleroderma. Scleroderma researchers have also focused on factors concerning aspects of the disease such as coping with and adjustment to scleroderma, body image satisfaction and illness perception (e.g., Angelopoulos et al., 2001; Richards et al., 2004; Roca et al., 1996). Research has also explored stress experienced by individuals diagnosed with scleroderma. A few studies found that stress events, emotional stress and recurrent infections were reported before or during onset of scleroderma (Hui et al., 2007). Stress events were also experienced by individuals in the year before onset of scleroderma, with scleroderma patients reporting

significantly greater scores on measures of stress experiences, than non-scleroderma participants (Chen et al., 2008). However these experiences were not directly linked to disease symptoms or severity.

Notably much of the research on scleroderma has found negative physical, psychological and social implications for the person diagnosed with this disease (e.g., Hyphantis et al., 2007; Malcarne & Greenbergs, 2005; Richards et al., 2004). Research to date has mostly focused on psychosocial aspects in relation to disease severity and coping with and adjustment to a diagnosis of scleroderma (e.g., Angelopoulos et al., 2001; Richards et al., 2004; Roca et al., 1996). Although people diagnosed with scleroderma appear to suffer a range of psychological problems these factors have received limited investigation, with the exception of depression. Several studies have focused on the high prevalence of depression in this population, with mixed findings. Studies reported mild to severe depression in 33% to 65% of scleroderma subjects (e.g., Angelopoulos et al., 2001; Beretta et al., 2006; Roca et al., 1996; Thombs et al., 2007). Depression is associated with some aspects of scleroderma such as pain, illness perception and body image satisfaction (e.g., Angelopoulos et al., 2001; Roca et al., 1996). A number of studies suggest that depression is associated with the disease process with higher levels of depression associated with more severe disease symptoms (Beretta et al., 2006; Thombs et al., 2007). Legendre and colleagues (2005) found that scleroderma was associated with a high prevalence of depression (43%) and anxiety (83%). Nietert and colleagues (2005) found that 36% of scleroderma patients reported experiencing depression, with higher levels of depression associated with cardiac involvement and reduced functioning of the gastrointestinal tract. Hyphantis and colleagues found that higher levels of depression were linked with esophageal problems, while elevated levels of anxiety were associated with pain related arthritis (Hyphantis et al., 2007). A study by Benrud-Larson and colleagues found that 50% of individuals diagnosed with scleroderma reported depressive symptoms, with

higher scores associated with pain (Benrud-Larson et al., 2002). Research to date that has focused on psychopathology associated with scleroderma, found that a majority of individuals diagnosed with scleroderma experience depression and anxiety related to both disease symptoms (such as gastrointestinal, cardiac, pulmonary and arthritis related pain), and psychosocial factors (including helplessness, hostility, defensiveness, and interpersonal sensitivity) (e.g., Angelopouloset al., 2001; Hyphantis et al., 2007; Legendre et al., 2005; Nietert et al., 2005). Depression and anxiety are therefore conditions that are likely to impact on scleroderma symptoms and psychological health.

However; the, origins of depression and anxiety in scleroderma have received little attention.

Early life experiences, emotions and cognitions and the physiological impacts on the immune system in relation to symptom severity and early onset may influence levels of anxiety and depression. These aspects have not been examined in relation to scleroderma and hence are explored in the current scleroderma study. Psychosocial variables associated with depression and anxiety, such as early memories of warmth and safeness, adult attachment and emotion regulation styles, levels of self-compassion and scleroderma onset were therefore explored. Physiological disease symptoms, breathing and intestinal problems, Raynaud's phenomenon, finger ulcers, skin involvement, pain and disability also need to be explored in relation to severity of depression and anxiety to further inform the literature on predictors of scleroderma symptoms. The current study examines these aspects in a comprehensive approach that strove to systematically link scleroderma and psychosocial stressors.

Social Stressors, Autoimmune Diseases and Scleroderma

A few studies have found that people diagnosed with scleroderma have experienced stressful life events prior to the onset of scleroderma (Chen et al., 2008; Hui et al., 2007). Hui and colleagues reported that individuals diagnosed with scleroderma experienced stress events, emotional stress and recurrent infections before or during onset of scleroderma (Hui et al.,

2007); while Chen and colleagues found that stress events were also experienced by individuals in the year before onset of scleroderma, with scleroderma patients reporting significantly greater scores on measures of stress than non-scleroderma participants (Chen et al., 2008). However neither of these studies explored stress experiences in relation to scleroderma onset, symptoms or disability, examined in the current study.

Research that has examined psychosocial factors associated with the onset or exacerbation of other autoimmune diseases has revealed a relationship with stress events (e.g., Akerman et al., 2002; Da Costa et al., 1999; Matos-Santos et al., 2001). Although stress is reported as a risk in the development of autoimmunity (e.g., Boscarino, 2004; Schore, 1994) a paucity of research has investigated stress and scleroderma.

As experiences of stress are common and the research available suggests that individuals with scleroderma may experience stress events as more overwhelming or threatening than individuals not diagnosed with scleroderma (Freedman & Ianni, 1983); research is needed on how stressful life experiences impact scleroderma symptoms and factors associated with coping with stress reactions. Research suggests stress and stressful life events are associated with autoimmunity (e.g., Akerman et al., 2002; Arnetz & Ekman, 2006; Boscarino, 2004; Da Costa et al., 1999; Heit et al., 1999; Matos-Santos et al., 2001; Schore, 1994; 2002; Stojanovich & Marisavljevich, 2008); and scleroderma (Chen et al., 2008; Hui et al., 2007).

Stress events can occur at any time across the lifespan and may begin in childhood. Adverse early life experiences can affect an individual's adaptive functioning in adulthood, influencing emotional and cognitive responses and strategies to manage stress and distress. The relationship between emotion regulation, stress and scleroderma has not been examined and these variables were therefore explored in the current study.

Gilbert and colleagues have explored early negative life experiences and suggest these experiences influence the development of the threat system and negative reactions. Gilbert

proposed that early life experiences deprived of warmth and safety, generally stimulate the threat system (Gilbert, 2000; Gilbert, 2002; Gilbert et al., 2006) and condition individuals to employ a range of negative emotional, cognitive and behavioural strategies (Gilbert, 2002; Gilbert et al., 2008; Irons, Gilbert, Baldwin, Baccus, & Palmer, 2006). These strategies involve avoidance behaviours and emotion suppression (Gross, 2002), and enable the individual to avoid or disengage from the threatening situation (Langens & Morth, 2003).

Gilbert (2002) suggested that the development of self-compassion increases the capacity to self-sooth and down regulate the threat system. The development of this strategy is generally facilitated through early nurturing experiences that include attachment behaviours. Early attachment experiences reflect adult feelings of security and emotional responses. Attachment behaviours reflect proximity seeking to attachment figures for protection from threat, facilitating emotion regulation responses through the provision of distress relief and reduction of heightened levels of arousal (Bowlby, 1997). The inability to reduce arousal levels affects immune functioning and is a risk in the development of autoimmunity (e.g., Schore, 1994), thus linking scleroderma to factors involving elevated arousal and the exploration of variables involved in hyper-arousal in the current study.

Unlike the inability to regulate emotions associated with early threat experiences, Neff (2003a; 2003b) suggested that self-compassion increases the capacity for self-care, reducing feelings of isolation by increasing feelings of connectedness to the suffering of other human beings. Self-compassion reflects an ability to positively regulate emotions that leads to increased feelings of autonomy and the capacity to provide care and compassion for both self and others. Higher levels of self-compassion unlike negative ways of relating to one's self are associated with positive health outcomes (Neff, 2003a; Reyes, 2011).

Individuals diagnosed with scleroderma tend to have a heightened stress response (Freedman & Ianni, 1983), when compared with individuals without scleroderma. This

response is likely to be linked to feelings associated with fear or threat and the ability to self sooth; and may reflect an inability to regulate emotions through self-compassion. Self-compassion (low), emotion regulation (suppression) and attachment styles (dismissive and fearful) that may invoke a stress response have not previously been explored in relation to scleroderma and were therefore examined in the current study.

Psychosocial aspects associated with managing stressful experiences and the related cognitive and emotional appraisal that may generate ineffective coping strategies associated with physiological arousal, immune dysregulation and psychopathology have not been investigated in relation to scleroderma disability and specific symptoms, such as Raynaud's phenomenon and pain. As experiences of stress before diagnosis of scleroderma have been scarcely investigated, this study set out to explore early memories of warmth and safeness and associated variables, such as how individuals with scleroderma relate to the self (self-compassion) and others (attachment styles), emotion regulation strategies (suppression, reappraisal) and levels of hyper-arousal and anxiety and depression, to evaluate the relationship between stress and scleroderma symptoms and onset.

Comparison Study - Community Group: While the study examined scleroderma, a comparison with another group of individuals without a diagnosis of scleroderma (study two) will be investigated as research demonstrates individuals diagnosed with scleroderma tend to have a heightened stress response (Freedman & Ianni, 1983), significantly greater scores on measures of stress (Chen et al., 2008) and experience greater levels of depression (e.g., Angelopoulos et al., 2001; Beretta et al., 2006; Roca et al., 1996), when compared to individuals without scleroderma. As experiences of stress and depression appear to be greater for people with scleroderma, exploring differences in psychosocial variables between people with and without scleroderma, may provide further understanding of what influences this disease.

Comparison Study – Illness Group: A comparison study (3) with a different immune related

illness (a depressed immune system: breast cancer, compared with an over-reactive immune system: scleroderma) was also investigated to aid understanding as to whether similar (and/or different), psychosocial variables investigated in the first study also applied to another illness group. Breast cancer was chosen as the comparison group as it is an immune related disease that is more prevalent in women than men (as is the case for scleroderma).

Cancer and Psychosocial Stress

Researchers suggest stress is associated with dysregulation of the immune system and is associated with other immune related diseases (that do not involve autoimmunity). Cancer related diseases unlike autoimmune diseases (that involves a hyper-responsive immune system) that attack healthy tissue (Smith & Kalhaleh, 2008) are associated with immune suppression (Whiteside, 2006). Biopsychosocial cancer studies have found associations between stress and individuals diagnosed with cancer. Research suggests an association with neuroendocrine-immune changes, psychosocial stress and an increased risk of cancer (Sephton & Spiegel, 2003; stress aspects are further explored in the literature review in study three related to breast cancer and the group comparison study). Scleroderma researchers have not previously compared differences in stressors in individuals with different immune responsive diseases such as cancer. The current study therefore investigated differences in the type of stressors experienced and/or strategies used to regulate emotions; in diseases that involve different immune responses (scleroderma: hyper-responsive and breast cancer: suppressed) and whether these experiences were linked to onset and increased symptomology of the respective diseases.

Breast Cancer: Research suggests that stress and trauma can significantly impact on an individual's immune system and may result in the development of disease. However the chemicals involved in the stress response in breast cancer may not always be related to psychosocial factors (Abercrombie et al., 2004; Spiegel, Giese-Davis, Taylor, & Kraemer, 2006). There are a number of known genetic, gender and physiological risk factors associated

with breast cancer, such as being female, having a family history of breast cancer, oestrogens and age of onset (Mavaddat et al., 2010; Eeles et al., 2004), as well as personal stress experiences (Palesh et al., 2007). As stress experiences are involved in the mechanisms associated with immune responses and autoimmune diseases, it is possible that different psychosocial variables as well as physiological factors may be associated with these two diseases.

Therefore the examination of difference and similarities in variables that are related to stress and disease were explored in the current study in relation to scleroderma and breast cancer; to determine the degree psychosocial stress influences onset and exacerbation of the respective diseases. Also investigated were more positive ways of relating to self through investigation of self-compassion; to determine whether difference occurred between illness groups for positive and negative interpersonal relating and the influence these experiences may have on disease symptoms and age of onset.

The Current Study

The current study compared immune (hyper-reactive and depressed) and non-autoimmune related conditions. Therefore the dependant variable across the three groups was type of immune related disease/no disease. This variable was hypothesised to account for differences between groups for levels of psychosocial experiences/functioning and in relation to disease onset and symptomology. This research project therefore investigated differences in psychosocial variables in individuals diagnosed with scleroderma, individuals diagnosed with breast cancer and individuals from a community sample, to determine stressors associated with psychological and illness related symptoms. This was determined by comparing early life experiences measured as early memories of warmth and safety and adult attachment style, emotion regulation (e.g., self-compassion) and mental health. Hyper-arousal and different factors associated with elevated disease symptoms and disease onset were also examined.

As stressors during childhood development can induce biological, psychological and behavioural responses likely to impact on immune functioning (for example the development of serious illness such as autoimmune diseases; Sachs-Ericsson et al., 2005) and subsequently adult ill health, the current study examined early life experiences and emotional and cognitive functioning (that may have developed in childhood) in adulthood in immune related diseases, scleroderma and breast cancer. These factors were investigated to determine whether differences occurred in experiences of stress and the management of stress (levels of self-compassion); and whether these experiences were related to the onset and/or levels of severity of disease symptoms and psychological injury in these individuals.

CHAPTER TWO – STUDY ONE: SCLERODERMA

Gilbert's Biopsychosocial Theory and Model

Three studies were conducted in the current project. The first study explored the relationship between psychosocial stressors and cognitive, emotional and physiological aspects associated with autoimmunity and psychological conditions such as anxiety and depression. The biopsychosocial model of health integrating psychoneuroimmunology, Gilbert's biopsychosocial theory of social mentalities and model of affect regulation systems (threat/protection and soothing/safeness systems; e.g., Gilbert, 2000; Gilbert, 2001; Gilbert, 2002; Gilbert, 2012) were utilized to capture the relationships of the variables under investigation. The first study aimed to investigate the influence psychosocial variables (EMWS, attachment, emotion regulation, self-compassion and hyper-arousal) have on scleroderma onset and symptoms, levels of depression, anxiety and stress, and the impact these mental health variables (depression anxiety and stress) have on scleroderma onset and symptomology. The primary variables of focus (16 in total) are captured within the three headings of biological, psychological and social. Biological factors include: hyper-arousal, subtypes of scleroderma (diffuse and limited sclerosis) scleroderma disability and pain,

Raynaud's phenomenon, finger ulcers, skin involvement, intestinal and breathing conditions; Psychosocial aspects of early experiences of warmth and safeness and attachment style; Psychological factors: emotion regulation/coping strategies of suppression, reappraisal and self-compassion; and mental health aspects of depression, anxiety, and stress.

Gilbert's Theory of Social Mentalities.

Social Mentalities Theory (Gilbert, 2000; Gilbert, 2001; Gilbert, 2002; Gilbert, 2012) suggests that humans have a number of "social mentalities" that are involved in the development of specific types of relationships; it draws on archetype, modern evolutionary, developmental and social psychology theories. This theory also utilizes biopsychosocial and neuropsychological approaches to explain the evolution of adaption to threat and safety in terms of the interrelationship between cognitions, emotions, motivation and behaviour in the social environment, as conscious or unconscious processes. Gilbert suggests these processes reflect underlying evolutionary-social systems, involved in both internal and external personal relationships involving evaluating potential threat, creating safe environments and regulating emotions associated with threat and safety. Gilbert (2012) argued that human beings are driven to pursue and acquire certain goals in environments that are often perceived as threatening and that these experiences, influence an individual's perceptions of how they experience their external and internal worlds.

Gilbert's social mentalities theory was selected for this research project to explore individual's experiences of threat (self and others), by examining whether limited early life exposure to warmth and safety, influenced intrapersonal (e.g., self-compassion) and interpersonal (attachment style) relationships and whether these aspects were linked to levels of hyper-arousal, psychological functioning and physiological symptoms in individuals diagnosed with scleroderma and breast cancer. Gilbert's theory and research has been applied to individuals with adverse early life experiences and the development of psychopathology. As a

number of mechanisms involved in the stress response are also involved in the development of scleroderma (e.g., inflammatory responses, vascular constriction and immune activation: Bolster & Silver, 2008; Smith & Kahaleh, 2008); it was hypothesised that these stress responses may also contribute to the development of scleroderma.

Gilbert's theory was therefore utilized in this study to examine and explain the likely processes related to early life experiences and the impact these experiences may have on emotion regulation and the relationship an individual develops with themselves and others; and whether these responses are likely to impact on the development and exacerbation of scleroderma and breast cancer symptoms.

Gilbert (2012) suggested that social mentalities guide an individual's interpersonal and intrapersonal actions to perform particular social roles that reflect a pattern of emotional and cognitive responses that could be described as social intelligence. Gilbert suggests social mentalities are implicated in threat focused and attachment behaviours associated with receiving and obtaining care. These safety seeking behaviours have the potential to negatively affect biological and psychological reactions (e.g., Gilbert, 2000; Gilbert, 2002; Gilbert, 2012). Gilbert suggested that early threat experiences may reflect defensive safety seeking behaviours (that do not afford safety) and influence defensiveness in adult relationships. He also suggested that compassionate care involves creating an environment of safeness and warmth, facilitating the development of a secure attachment (Gilbert, 2002; Gilbert, 2012). Therefore in the current study these experiences are hypothesised to influence positive or negative interpersonal and/or intrapersonal responses, the capacity to self-sooth and regulate the stress experience and the subsequent release of chemicals involved in the fight and flight response that can generate inflammatory and vascular conditions implicated in the development of scleroderma.

Gilbert suggested that secure attachment fosters an individual's capacity to provide soothing experiences and compassionate behaviour to oneself and others, activating the

safeness-social mentality. Whereas the threat mentality is activated in situations of perceived and actual threat; for example when children experience threatening home environments, deprived of warmth and safety, they tend to lack experiences of positive affect and therefore the infrequent activation of the soothing/safety system. In this situation the individual is more likely to stimulate the threat system and view others as potentially threatening (Gilbert, 2000; Gilbert, 2002). These strategies tend to condition the individual to utilize a range of negative emotional, cognitive and behavioural strategies such as self- criticism and the development of defensive tactics (e.g., Gilbert, 2002; Gilbert et al., 2008; Irons et al., 2006) such as avoidance behaviours and emotional suppression (Gross, 2002), to divert attention away from the threat situation (Langens & Morth, 2003).

As individuals who function in the threat mentality tend to have experienced critical early environments deficient in compassion; in the absence of compassionate soothing experiences, the internalisation of these early external threat experiences may impede the development of the self-soothing social mentality and lead to an inability to self-sooth and use effective strategies for regulating the emotional response and cope with distress (e.g., Gilbert, 2000; Gilbert, 2001; Gilbert, 2002). Engaging defensive strategies to avoid internal and external threat experiences may increase self-critical cognitions (Gilbert, 2000; Gilbert et al., 2004; Gilbert et al., 2006), susceptibility to conditions such as anxiety and depression (e.g., Gilbert, 2001; Gilbert, 2007; Gilbert, 2012; Gilbert et al., 2006) and physiological responses such as increased sympathetic nervous system activation (Campbell-Sills et al., 2006) and immune dysregulation (Schore, 1994). Therefore the examination of factors involving interpersonal and intrapersonal relationships, such as early childhood stress (EMWS), attachment style (fearful and dismissive) and ineffective emotion regulation/coping strategies (low self-compassion and emotional suppression), that have the potential to influence immune system functioning (hyper-arousal and scleroderma symptoms and onset), were explored to

determine the impact negative relational experiences may have on disease symptoms of scleroderma; and the influence these biopsychosocial factors may have on the mental health (depression and anxiety) of individuals diagnosed with scleroderma.

Affect Regulation Systems

Gilbert's theory of affect regulation systems was selected as an explanation of the underlying emotional and chemical responses that result in certain interpersonal and intrapersonal behaviours that involve the capacity to self-sooth and regulate the threat response; and therefore the potential to influence immune responses involved in the development of scleroderma. Gilbert (2010) suggests there are three dominant emotion regulation systems in the brain, one negative type involving threat and two types of positive affect: the drive/seeking and self-soothing/contentment systems. The drive/seeking system may be associated with dopamine, and the soothing/contentment system with neuropeptides such as oxytocins and vasopressin. Gilbert and colleagues proposed that the development of the self-soothing/contentment system is important as it regulates the threat and drive systems.

The development of a dominant threat system is fostered through early experiences of threat and affective states associated with feeling unsafe or uncared for. Experiences that promote the development of neural networks in the soothing system in this situation are likely to be inadequate and may result in behaviours associated with the drive or threat systems. Individuals unable to access the soothing system may respond defensively and may have difficulty feeling safe or content. Individuals who have early experiences of regular soothing generally are calmer and able to regulate emotions when stressed and are less likely to experience depression, anxiety, stress, insecure attachment and self-criticism (Gilbert et al., 2006; Gilbert, McEwan, Mitra, Franks, & Richter, 2008).

Self-criticism develops when individuals focus on their own inadequacies and failings; a negative evaluative strategy (Neff, 2003a) associated with psychological conditions such as

depression (Gilbert et al., 2006; Gilbert, 2007). The development of self-criticism is associated with adverse childhood experiences, indicating uncaring, unaffectionate and critical parents. Repeated negative childhood experiences may result in difficulty regulating the emotional response due to an inability to self sooth and reassure (Gilbert et al., 2004). Individuals who have developed without these positive soothing experiences may lack the resources during times of stress to regulate negative emotions and feel safe and content; conversely individuals with positive experiences tend to be kinder to themselves when faced with adverse experiences through the ability to self-reassure and regulate negative emotions (Bowlby, 1997; Gilbert et al., 2004). The incapacity to provide self-reassurance and engage in self-soothing strategies when stressed may result in ineffective negative emotional regulation strategies low in self-kindness (Gilbert et al., 2004).

Self-kindness (an element of self-compassion) unlike self-criticism lessens the impact of negative affective experiences and provides opportunities to develop a more balanced view of individuals' cognitions and emotions. Self-compassion involves engaging in personal acts of self-kindness when experiencing adverse situations or perceptions of personal inadequacy by providing warm supportive responses rather than actioning self-criticism. Self-compassion enables individuals to view themselves from a more human perspective by providing nonjudgmental strategies to understanding their own inner struggles and disappointments. It also involves being mindfully aware of painful thoughts and feelings, rather than suppressing or over-identifying with them and provides a more positive emotion regulatory approach, founded not on an evaluative process but on kindness and understanding towards the self (Neff, 2003a; Neff et al., 2007).

Positive early experiences that engender feelings of warmth, nurturing and safety have been associated with well-being (Irons et al., 2006; Schore, 1994), while negative experiences are associated with the development of insecure attachment styles, anxiety (Mikalincer &

Shaver, 2007), depression, stress, self-criticism (Gilbert et al., 2008) and emotion regulation strategies, such as suppression and avoidance (Gross, 1998; Hayes, Wilson, Gifford, & Strosahl, 1996; Iwamitsu et al., 2005). These negative experiences as well as the capacity to provide one-self with self-compassion (rather than self-criticism) were explored in relation to scleroderma (and breast cancer) symptoms and onset, to determine whether different interpersonal and intrapersonal experiences influence positive and/or negative health outcomes for individuals diagnosed with scleroderma.

Early Memories of Warmth and Safeness

Further evidence that supports examining the variables in the currents study in relation to scleroderma relates to early childhood experiences. Research suggests negative early childhood experiences can have detrimental effects on the social functioning, psychological and physical health of individuals. Gilbert (2007) suggests early life experiences influence gene expression and the biological and psychological functioning of the brain. These early life experiences are expressed as different types of emotion regulation and social communications that reflect cognitive and behavioural patterns of threat and safety. Positive early experiences that engender warmth and safety have been associated with well-being (Schore, 1994), while negative experiences with low self-kindness and/or the development of self-criticism (Brewin, Firth, Cozens, Furnham, & McManus, 1992; Neff et al., 2007), are associated with poorer psychological outcomes such as depression and self-hatred (Irons et al., 2006). Gilbert and colleagues (2008) suggested that feeling safe and content is a determinant of psychopathology, attachment style and self-evaluation.

Positive nurturing experiences that foster feelings of warmth (such as tenderness, kindness and concern) and safeness (feeling safe rather than safety seeking) are associated with a lower risk of developing psychopathology (Mikulincer & Shaver, 2007). Whereas negative rearing environments where abuse, perceptions of parents being non-caring

(FinziDottan & Karu, 2006) and neglect are generally associated with an increase in negative affect and a vulnerability to psychopathology (Heit et al., 1999; Schore, 1994). When early environments are experienced as threatening and fail to provide feelings of safeness and warmth a lack of stimulation of the positive affect and warmth systems and an over-activation of the threat/defence/protective systems may occur (Gilbert et al., 2008). Feeling safe and content has a significant negative correlation with depression, anxiety, stress, self-criticism and insecure attachment (Gilbert et al., 2008) As psychosocial stress, particularly early threat experiences have the potential to impact on immune and psychological functioning; the areas discussed above provide further support for exploring these aspects in relation to scleroderma symptoms and psychological functioning of individuals with scleroderma in this study.

The EMWS scale was selected to measure negative childhood experiences, as a lack of early positive rearing experiences or memory associated with early threat, may leave an individual unable to match negative emotions with specific events. The inability to explain this sense of threat or negative affect may result from events that were experienced as subtle non-verbal communications or as preverbal experiences (Richter, Gilbert, & McEwan, 2009). How an individual responds to an event (both physiologically and emotionally) may be a better indicator of threat than recall of stressful events, as some individuals may recall parents as kind and available, but still feel fearful and lack a sense of belonging. Others may have experienced negative events but felt they managed and coped well (Richter et al., 2009). The recall of positive or negative feelings associated with early rearing experiences generally relies on the recollection of an individual's own inner experiences, rather than recalling events related to other's behaviour as an indicator of stress. Recall of affect in relation to childhood memories may therefore explain feelings of threat not accounted for by the recall of any particular stressful event. This view of exploring an individual's experience of threat was therefore employed in this study to measure (using the early memories of warmth and safety

scale) scleroderma participant's reporting of early life exposure to warmth and safety and the influence these experiences may have on scleroderma symptomology and onset.

Attachment

Attachment Style: Attachment theory describes the interactions between a child and his or her primary caregiver and the influence these communications have on an individual's ability to regulate emotions and cope with stress across the life span (Bowlby, 1997). Bowlby suggested that people are born with an innate psychobiological system that motivates people to seek proximity to attachment figures for protection from threat (safety seeking behaviours; Gilbert, 2012) and in turn facilitates the regulation of emotional responses by providing relief from distress and assistance to reduce heightened arousal (Bowlby, 1997). The failure to reduce arousal levels affects immune responses, future immune functioning and is a risk in the development of autoimmunity (e.g., Schore, 1994). Investigation of the impacts insecure attachment styles may have on scleroderma symptoms, levels of arousal and psychological functioning in this illness population were therefore explored in the current study.

Bowlby (1998) observed differences in attachment figures functioning in relation to availability, responsiveness and supportiveness in times of need. The availability and responsiveness of attachment figures to act as an emotional regulator, affects a child's sense of attachment security resulting in the development of either a secure or an insecure attachment style (Bowlby, 1997; Ainsworth, 1985). Insecure attachment may invoke a threat response that produces anxiety, fear and distress in similar future situations due to uncertainty about the accessibility and security of their attachment base (Mikulincer & Shaver, 2007). Ainsworth described insecure attachment behaviours as a pattern that reflects a defensive response resistant to change, due to expectations the child has developed during interactions with the parent. For example the development of avoidant behaviours may result in a defensive pattern due to experiences around rejection and seeking close contact with the parent. The child may

not seek this proximity due to defensive strategies to protect the self from rejection, therefore avoiding the experience most desired and reducing the opportunity to change the insecure attachment style (Ainsworth, 1985). Defensiveness has been reported in scleroderma research (e.g., Angelopoulos et al., 2001) and may reflect insecure attachment styles, early life stress and avoidant emotion regulation strategies in this population. Therefore the relationship between these factors and the onset and severity of scleroderma symptoms were investigated to determine the influence these factors may have on this disease.

Bartholomew and Horowitz (1991) expanded Bowlby's internal working model of self and others by developing a model of individual differences in relation to adult attachment. These two underlying dimensions that represented positive or negative aspects of a person's internal model of self and others were used to define four patterns of attachment. Bartholomew and Horowitz described individuals with a fearful attachment style as cold-passive, who demonstrated negative models of self and exhibited high levels of anxiety and arousal. Fearful and dismissive individuals demonstrated avoidant behaviours and difficulties in becoming close to and relying on others; however, they differed in their sense of self-worth, with fearful attached individuals demonstrating a lack of assertiveness and a sense of social insecurity (Mikulincer & Shaver, 2007).

Dismissive individual's exhibit independent behaviours and a positive view of themselves; however, their underlying insecurity results in avoidance and distancing due to their uncertainty that others would assist then in times of need. Fearful individuals have negative expectations of both themselves and others and are highly anxious, self-doubting, self-conscious and cautious. Dismissing and fearfully attached individuals use avoidant strategies, while fearful individuals, exhibit high levels of anxiety (Simpson & Rholes, 1998). Insecurely attached individuals tend to lack the resources necessary to cope successfully with and adapt to adverse situations (e.g., Bowlby, 1998; Mikalincer & Shaver, 2007). They tend to

appraise stressful situations as more demanding and difficult to manage, than securely attached individuals and lack the ability to regulate their emotions, as a result of experiencing parents that were ineffective in their management of the individual's distress as a child (e.g., Bowlby, 1998; Mikalincer & Shaver, 2007). Individual differences in attachment styles were explored in the current study as they were hypothesised as possible determining factors in relation to coping strategies, the extent stress is managed and symptom severity in individuals diagnosed with scleroderma.

A number of attachment styles have been described in the literature, for example in a (25-year) review of adult attachment measures, Ravitz and colleagues critiqued different methods of assessing a range of attachment styles. A number of interview measures of attachment such as the adult attachment interview (AAI; developed by George, Kaplan, and Main in 1984) assess narrative coherence as an indicator of secure attachment, three categories of this measure are similar to the infant attachment categories, secure: (free) /autonomous, and insecure attachment styles: avoidant/dismissing, and anxious (enmeshed)/preoccupied (ambivalent/resistant in infant category). This measure also includes a fourth category "unclassifiable". Individuals can be classed as "unresolved" with regard to abuse, trauma, or loss. Projective tests are also used to evaluate an individual's capacity to sustain self and other boundaries and assess attachment repair. While self-report scales measure conscious attitudes and awareness of behaviors related to experiences of trust, intimacy, dependence, separation, and loss. Attachment has been described as "state-dependent traits." Attachment behaviors are not always obvious however they are generally activated by negative events such as situations of threat or isolation. Trait-like patterns of behavior are also triggered in situations where relationship expectations such as others' trustworthiness or one's lovability and can influence attachment behavior.

Attachment measures involve *categories* of attachment style or measure various

dimensions of attachment. Two dimensions of insecure attachment have been identified: attachment anxiety (negative sense of self) and attachment avoidance (negative sense of others). Attachment anxiety is characterized by an expectation of separation, abandonment, or insufficient love; a preoccupation with the availability and responsiveness of others; and hyper-activation of attachment behavior. Attachment avoidance is characterized by devaluation of the importance of close relationships, avoidance of intimacy dependence, self-reliance, and relative deactivation of attachment behavior. Categories can be derived from dimensional scales such as Bartholomew and Horowitz's four-category model which reconciles dimensional and categorical models by identifying categories on the dimensions of attachment avoidance and attachment anxiety. Secure attachment is defined as a relative absence of attachment anxiety and attachment avoidance. The insecure attachment styles that include preoccupied is described as an experience of high attachment anxiety and low attachment avoidance; dismissive attachment is described as high attachment avoidance and low attachment anxiety; and fearful attachment is defined as a combination of high insecurity on both dimensions of attachment anxiety and attachment avoidance (Ravitz, Maunder, Hunter, Sthankiva & Lancee, 2010).

Early attachment stress may result in an individual becoming over-stimulated, creating hyper-arousal in relatively minor situations in adulthood (Van der Kolk & Greenberg, 1987). Fearful attached individuals long for their partner’s love and support, however, they fear the possible negative consequences of intimacy and reliance on significant others. This style of adult attachment resembles the disorganized attachment style of simultaneous patterns of approach and avoidant behaviours found in abused children. Fearful avoidant strategies in adulthood result from a failure to achieve any of the major attachment goals of security and safety following proximity seeking due to experiencing unpredictable behaviours by the primary caregiver (Mikalincer & Shaver, 2007). These individuals have difficulty recalling

distressing events without becoming overwhelmed by intense feelings or they utilize strategies of denial or suppression to manage emotions (Mikulincer & Shaver, 2007).

Individuals often attempt to adapt and function within unstable and abusive environments and may develop resilient coping strategies in the event they receive secure attachment experiences in later relationships. Individuals who lack this exposure often experience long term insecure attachment problems and exhibit stimulus seeking behaviours that increase arousal (Wilson, Friedman, & Lindy, 2001). Attachment styles were explored in the current study to determine the impact these experiences may have on levels of hyper-arousal, psychological functioning and scleroderma symptom severity.

Attachment - Physiological Responses: Adult feelings of security and emotional responses reflect attachment behaviours learned in early childhood. The attachment system developed to down-regulate levels of arousal generated by the threat/defence system (Gilbert, 2012). Heightened chronic experiences of distress in childhood that are not regulated externally by an attachment figure may affect the child's developing right brain, influencing the limbic system and ongoing threat related arousal (Schore, 2002). Early right brain development occurs in the context of attachment relationships with the primary caregivers. The attachment experience reflects regulation or dysregulation of the stress response and how the right hemisphere of the brain develops (Schore, 2002). Children who receive inadequate emotion regulation experiences are vulnerable to heightened states of arousal, the development of ineffective copying strategies for regulating emotions and psychopathology (Schore, 2002). Responsive attachment figures in adulthood facilitate secure attachment; however, when adult attachment figures are unavailable and do not provide a sense of safety, attachment related fears may trigger insecure attachment responses and anxiety disorders (e.g., Gilbert, 2012; Mikulincer & Shaver, 2007). Anxiety has been reported in the scleroderma population and was investigated in the current study in relation to early life experiences and attachment styles.

Scleroderma: The Immune System and Psychosocial Variables in the Current Study

Attachment and the Immune System

Attachment distress is regulated by the primary caregiver's ability to attend to and calm the infant. When the infant's distress is not adequately reduced high levels of the stress hormones ACTH and corticosteroids are released along with lower levels of endorphins (Schore, 1994). The mother's ability to act as an external regulator when a child is distressed affects the child's developing immune and neuro-endocrine systems influencing an individual's vulnerability to psycho-physiological illness and affecting their ability to recover from psychological disorders and physiological disease over the lifespan (Schore, 1994). Social and emotional interactions are processed by the right hemisphere of the brain and regulate the secretion of the stress hormone cortisol, affecting cells in the immune system. Hypersecretion of cortisol is primarily trigged by attachment insecurity and may continue into adulthood (e.g., Arnetz & Ekman, 2006; Schore 1994).

An individual's capacity to regulate arousal early in life influences immune responses and future immune functioning. A study investigating immune related disease and attachment found that individuals experiencing breast cancer reported significantly higher levels of avoidant attachment style than individuals without a diagnosis of breast cancer (Tacon, Caldera, & Bell, 2001). Early adverse experiences may influence vulnerability in numerous areas of functioning involving the threat systems including regulating emotions and accentuating the experience of stress (Schore, 1994). These vulnerabilities may partly explain the relationship between stress experiences and the onset of scleroderma reported by a majority of individuals in the two stress studies (Chen et al., 2008; Hui et al., 2007); and are aspects further investigated in the current study through the exploration of insecure attachment styles (fearful and dismissive) to determine the effects these interpersonal stress experiences (threat

/fear and the likely defensive responses) have on individual's illness related and mental health functioning.

Emotion Regulation - Suppression, Psychological and Physical Health

Threat related emotion regulation strategies are associated with early social experiences of threat, attachment insecurity, a lack of nurturing and the development of negative psychological and physiological health outcomes (e.g., Bowlby, 1997; Gilbert et al., 2006; Gross & John, 2003; Mikulincer & Shaver, 2007). Emotion regulation refers to the processes, by which an individual influences the nature and conditions, under which any emotion is expressed or experienced (Gross, 1998). Gross (1998) defined emotion regulation as a process of managing the experience and expression of emotions either consciously or unconsciously; that differs from concepts such as coping and mood regulation. Emotion regulation involves the evaluation of a situation and the generation and processing of emotions that include modifying cognitions and responses.

When the expression of an emotion is not processed but inhibited, a physiological response occurs that varies considerably in individuals. This strategy enables an individual to decrease the expression of the emotional experience, however, this process subsequently increases physiological responses such as increased sympathetic activation of the cardiovascular system (Gross, 2002) and can influence health (Petrie, 1998). Gross and Levenson (1993) described emotion suppression as an emotion regulation strategy that involves intentionally inhibiting the expression of emotion while aroused emotionally. This behaviour reduces awareness of an emotion creating ambiguity and the capacity to reappraise the negative experience (Gross & John, 2003). Hayes and colleagues (1996) suggested that excessive suppression of an emotional experience can result in distorted cognitions and is a risk for developing psychological conditions. Thought-suppression has been found in a number of studies to produce the opposite effect of the intended objective that is to conceal the

thought from conscious awareness. Gold & Wegner (1995) found that excessive negative self-evaluation can lead to unproductive attempts to regulate unpleasant or distressing private experiences by increasing the frequency of the thought or feeling. Lynch and colleagues (2001) also found in two studies that thought suppression was associated with more intrusive thoughts after exposure to emotion provoking stimuli (Lynch, Robins, Morse, & Krause, 2001). Negatively evaluated recurring internal distressing experiences, such as memories, emotions, cognitions and physiological sensations (Hayes et al., 1996) experienced as threatening (Gilbert, 2007), tend to result in the utilization of avoidance or suppression as strategies to manage these negative experiences (Gilbert, 2007; Hayes et al., 1996). This approach; however, may have negative physiological consequences, as these strategies tend to directly activate the threat system and initiate the stress response (Gilbert, 2007). Thought suppression has been found to influence the immune and cardiovascular systems and experiences of pain. Petrie, Booth, and Penebaker (1998) found that the suppression of thoughts decreased circulating T lymphocytes and T suppressor cells and total number of lymphocytes; whereas expressing thoughts increased the number of T helper cells and total lymphocytes. Findings suggest that the long term effects of suppression, particularly thoughts with emotional content may cause changes in immune functioning that can impact on health. Therefore the current study examined the relationship between the emotion regulation strategy suppression and scleroderma symptoms, as it was hypothesised that these intrapersonal aspects may influence immune related symptoms of scleroderma.

Research has also found an association between pain and the regulation of emotions. Thomas and colleagues found that individuals with chronic pelvic pain who suppressed unwanted thoughts associated with past abuse were likely to experience higher levels of pain (Thomas et al., 2006). Investigation of suppression of emotion in a physical illness population (Iwamitsu et al., 2005) also found negative outcomes for individuals diagnosed with breast

cancer. This research found that breast cancer patients who engaged in emotional suppression had elevated levels of anxiety, depression, anger and psychological distress, when compared to individuals without breast cancer.

Research suggests that excessive suppression of emotional experience can result in distorted cognitions and are a risk for developing psychological conditions (Hayes et al., 1996) such as anxiety, depression (Gross & John, 2003; Iwamitsu et al., 2005), an insecure attachment style, (Mikulincer & Shaver, 2007) and physiological conditions such as immune dysfunction (Petrie et al., 1998; Schore, 1994) and pain (Burns et al., 2006; Thomas et al., 2006). Research has demonstrated that thought suppression is an emotion regulation strategy associated with negative outcomes for the individual through a process that influences psychological and physical health including experiences of depression, anxiety and pain, and functioning of the immune and cardiovascular systems.

Depression, anxiety, immune conditions and pain are associated with scleroderma and have not previously been investigated in relation to suppression. Therefore the current study examined the relationship between suppression and scleroderma symptoms including pain and psychological factors such as depression and anxiety, to determine the influence suppression may have on immune related symptoms of this disease (and breast cancer).

Self-Compassion: Biopsychosocial Implications

Self-compassion is also an emotion regulation strategy, however it does not involve avoiding or suppressing negative experiences that are likely to (Neff, 2003a) engage chemicals such as cortisol, implicated in the threat system (Gilbert, 2002). This strategy involves kindness and understanding toward the self (Neff, 2003a; Neff et al., 2007), through an awareness of distressing feelings and treating oneself with kindness and understanding. Self-compassion involves recognising that suffering and disappointment are part of being human and that people are worthy of kindness and compassionate care (Neff, 2003a). Self-

compassion is similar in definition to the concept of compassion.

Compassion is defined as an openness and connection to the suffering of others that results in feelings associated with sympathetic caring. Compassion felt toward another generally involves a non-judgmental view of an individual's mistakes and a shared human understanding with the person's experience. When compassion is applied to the self, it requires a kind openness to one's own suffering and pain, allowing an accepting kindness toward less favourable attributes and inadequacies, when not managing a situation as well as expected. Experiencing failure as part of a shared human condition helps reduce feelings of isolation and the likelihood of becoming immersed in the emotional experience associated with the situation. Self-compassion requires a kindness and understanding towards the self in situations where one experiences disappointment, emotional or physical pain; rather than engaging in strategies that involve over identifying with the situation, or disconnecting from the collective human experience of suffering, associated with feeling isolated and alone. Self-compassion allows an individual to view the experience from an outside perspective, disengaging from the exaggerated experience of over identifying with the subjective content and providing kindness to the self from the self; that is from another perspective, a mindful and more balanced view (Neff 2003a).

Self-compassion involves developing the ability to become mindfully aware of these experiences, rather than over-identifying with them, lessening the impact of the negative experience and enabling opportunities to develop a more holistic view of one's situation (Neff, 2003a). Mindfulness in this situation involves compassionate awareness and acceptance of experiences occurring in the present moment. Mindfulness allows one to remain connected to and evaluate a situation from an emotional distance, reducing immersion in the experience and providing the opportunity to observe thoughts and feelings as they occur, without judgment. Mindful self-kindness unlike self-criticism lessens the impact of negative affective

experiences, by providing opportunities to reduce heightened threat responses resulting from a threat processing deficit (Gilbert, 2007) and develop a more balanced view of one's cognitions and emotions (Neff, 2003a).

This strategy provides a more positive emotion regulatory approach, as it is not based on an evaluative process (Neff, 2003a) involving the threat system (Gilbert, 2007), but on kindness and understanding toward the self (Neff, 2003a; Neff et al., 2007). Self-compassion has been described as a strategy to regulate negative emotions, through being aware of and not avoiding or suppressing distressing feelings and treating oneself with kindness and understanding, as a fellow sufferer of humanity. Self-compassion changes one's negative view of self, to a more positive view of self, because it is not based on an evaluative process, but on kindness and understanding and embracing one's common humanity (Neff, 2003a). Self-compassion therefore is concerned with being open to one's suffering and not avoiding it. Self-compassion has a negative association with depression, anxiety, self-criticism and thought suppression (Neff, 2003a). Self-compassion has not been examined in relation to scleroderma symptomology and onset. This factor was explored in scleroderma and breast cancer as it was hypothesised that self-compassion may act as a protective factor for immune functioning and therefore would provide more positive health outcomes for individuals who engage in this emotion regulation strategy.

Neff developed the self-compassion scale (2003b), that has been widely used to measure this construct. This scale utilized in the current study, constitutes the three major aspects of self-compassion discussed above; self-kindness, common humanity and mindfulness. Self-kindness refers to treating oneself with warmth and care without engaging in self-judgment. Common humanity indicates an ability to understand one's suffering or inadequacies as part of shared human experiences, rather than feeling alone or isolated. Mindfulness describes a capacity to employ a balanced view rather than over-identifying with

the experiences and is a protective behaviour for experiences of anxiety (Neff, 2003b).

Research has demonstrated a link between the benefits of self-compassion and psychosocial aspects; however, only a few studies have investigated self-compassion and physiological factors (e.g., Pace et al., 2009; Wren et al., 2011). Compassion researchers also investigated psychosocial stress and physiological reactions of the neuro-endocrine and innate immune systems. Pace and colleagues found that people who engaged in more compassion focused meditation when compared to people with less engagement, scored lower on physiological responses such as cortisol levels and psychological measures of distress; suggesting that stress induced immune and behavioural responses may be moderated by compassion focused meditations (Pace et al., 2009). Therefore strategies high in self-compassion are likely to produce positive physical and psychological health outcomes (Neff, 2003a; Pace et al., 2009).

Self-compassion provides a solution for threat processing difficulties, and is negatively associated with depression, anxiety, self-criticism and thought suppression and positively associated with life satisfaction (e.g., Gilbert 2007; Neff, 2003a; Neff et al., 2007), stress reduction (Sharpiro, Astin, Bishop & Cordova, 2005) and lower cortisol levels (Pace et al., 2009). Self-compassion is significantly related to adaptive functioning and positive health outcomes (Neff et al., 2007). Self-compassion was found to be a protective factor for psychological distress in women experiencing body changes resulting from breast cancer treatment (Przezdziceki et al., 2013).

No study the author is aware of has explored self-compassion and scleroderma; however, based on the literature presented, it is reasonable to hypothesise that, lower self-compassion is likely to be associated with higher levels of psychopathology (such as anxiety and depression) and elevated scleroderma symptoms (autoimmune activation). As self-compassion is associated with wellbeing (e.g., Neff, 2003a), the development of inner (self)

compassion may therefore provide physiological and psychological health benefits (Gilbert, 2002) to individuals with compromised psychological and immune functioning. Self-compassion strategies are theorised to act as a protective factor (Neff, 2003a), with a lowered experience of self-compassion likely to be associated with elevated scleroderma symptoms.

Strategies that involve avoiding or suppressing painful emotions associated with lower experiences of self-compassion and a heightened physiological response to stress may also be linked to increased scleroderma symptoms. Ineffective emotion regulation strategies, that involve avoidance such as suppression, insecure styles of relating (such as dismissive and fearful attachment) and levels of self-compassion, have not been investigated in relation to scleroderma and may be factors associated with pain and disability, experienced by individuals diagnosed with scleroderma.

Hyper-arousal, the Immune System and Scleroderma

Hyper-arousal is a physiological response that involves the threat system (e.g., Every & Lating, 2002) and is associated with psychological conditions and the development of autoimmunity (Schore, 1994). Hyper-arousal is described as physical or emotional tension produced by hormones during the fight-or-flight response. The intensity of this response is generally dependant on an individual's response to a stressor (e.g., Every & Lating, 2002; Selye, 1976) and an ability to adapt to repeated exposure to stimuli (Hammad, Barsky & Regestein, 2001). Exposure to unexpected stimuli may produce excessive arousal reactions and increased cortisol (a stress hormone) levels. Individuals with irregular cortisol arousal may be unable to distinguish between physically harmless and threatening stimuli, frequently engaging the fight and flight response in non-threatening situations. This condition may overwhelm an individual's resources to accurately process information, decreasing selective attention abilities, resulting in ambiguous meaning and difficultly discriminating between meaningful and insignificant stimuli (Hammad et al., 2001).

Arousal is also influenced by genetic factors and is higher in individuals who are more physiologically and emotionally reactive (Pfaff, 2005). Virtually any stressor whether physical or psychological will result in a rapid increase in ACTH (Rice, 1999). The adrenals respond to stress by secreting a number of hormones including epinephrine (adrenaline), norepinephrine (noradrenaline) and glucocoticids that include the hormone cortisol (Rice, 1999). The main function of the glucocorticoid system is to keep the stress response in check (Rice, 1999). High levels of the stress hormone cortisol can have negative effects on the immune system, while epinephrine and norepinephrine affect the sympathetic nervous system (SNS; Rice, 1999). When an individual experiences heightened levels of stress the body may excrete high levels of epinephrine and norepinephrine, ACTH and other hormones. The SNS increases heart rate and blood pressure and constricts the arteries to the kidneys that may result in hypertension. The release of rennin by the kidneys also occurs, constricting and causing damage to the arteries over prolonged periods of stress (Rice, 1999). Hypertension, and constricted blood vessels are conditions associated with scleroderma (Varga, 2004).

Norepinephrine and dopamine (catecholamines) are involved in regulating the amygdala (Every & Lating, 2002). Norepinephrine increases the fight and flight reactions and hyper-vigilance to threat (Every & Lating, 2002). The release of dopamine into the amygdale creates a conditioned fear response as a result of an over-reactive amygdale intensifying the fear response associated with hyper-arousal (Every & Lating, 2002). Hyper-arousal is associated with a number of biopsychosocial stress related factors. It forms part of the fight and flight response that functions to protect an individual from threat, however over-reactive protection defences that create excessive arousal reactions are a risk factor in the development of autoimmunity (e.g., Schore, 1994). It has been suggested that individuals diagnosed with Raynaud's phenomenon and scleroderma have a heightened stress response (Freedman & Ianni, 1983); as hyper-arousal is involved in the stress response and autoimmunity (eg., Every

& Lating, 2002), it may also be a condition associated with individuals diagnosed with scleroderma. As arousal is higher in individuals that are more physiologically and emotionally reactive (Pfaff, 2005) and individuals diagnosed with Raynaud's phenomenon and scleroderma have a heightened stress response (Freedman & Ianni, 1983). The exploration of factors (adverse early life experiences) that may influence the development of inadequate emotion strategies, that contribute to heightened levels of physiological arousal; and the relationship between hyper-arousal and increased scleroderma symptom severity require investigation.

Hyper-arousal is associated with the stress response (e.g., Every & Lating, 2002) and the development of autoimmunity (Schore, 1994), conditions associated with scleroderma. Hyper-arousal has not previously been examined in relation to scleroderma, and will be explored (using a self-report measure the hyper-arousal scale) in relation to onset, symptom severity, disability and psychosocial factors implicated in the stress response (EMWS, attachment style, emotion regulation strategies: suppression and self-compassion).

These factors were explored to determine the relationship between early childhood experiences, ineffective emotion regulation strategies, levels of arousal, psychological functioning and symptom severity; to determine whether the development of a heightened stress response is related to early life experiences and whether these experiences have contributed to an earlier onset and exacerbation of symptoms, experienced by individuals diagnosed with scleroderma. Levels of self-compassion where also explored to determine whether more positive (where compassion is greater) and/or more negative (compassion is lower) psychological and physical health outcomes were related to hyper-arousal.

Depression, Anxiety, the Immune System and Scleroderma

Depression and anxiety are common conditions associated with the management of many diseases and illnesses (Hill et al,. 2011; Kiecolt-Glaser & Glaser, 2003; Nietert et al.,

2005) and in scleroderma have been associated with symptom severity (Beretta et al., 2006; Thombs et al., 2007). Several studies have demonstrated a link between scleroderma and psychological conditions, such as anxiety and depression (e.g., Angelopoulos et al., 2001; Hyphantis et al., 2007; Richards et al., 2004; Roca et al., 1996). These studies revealed a high prevalence of depression related to aspects of the disease and psychological factors not associated with scleroderma symptoms. Research also suggests immune alterations are implicated in psychological conditions such as depression and anxiety (e.g., Miller, 2005). As depression and some types of anxiety have been reported as impacting on the immune system (e.g., Kiecolt-Glaser & Glaser, 2002; Miller, 2005), a diagnosis of depression and/or anxiety prior to the development of scleroderma (or breast cancer) may contribute to the onset of disease and or exacerbation of diseases symptoms. Anxiety and depression have been associated with immune related diseases and are often preceded by stressful events (e.g., Kiecolt-Glaser & Glaser, 2002; Miller, 2005). Depression resulting from stress may activate biological mechanisms that increase cytokine secretion and hyperactivity of the HPA-axis that affect the immune system (e.g., Kiecolt-Glaser & Glaser, 2002). Prevalence rates for depression in a number of general population studies range from 4.9% to 17.1 % for lifetime prevalence with previous month rates ranging from 3.2% to 5.2% (e.g., Pignone et al., 2002; Wilhelm, Slade, Brownhill, & Andrews, 2003). The DSM V reports lifetime prevalence of depression in community samples at approximately 7% and varying from 10% to 21% in women (American Psychiatric Association, 2013).

Studies of depression experienced by participants in scleroderma samples revealed that mild to severe depression was reported by 33% to 65% of individuals (Angelopoulos et al., 2001; Beretta et al., 2006; Roca et al., 1996; Thombs et al., 2007), indicating that scleroderma patients experience higher rates of depression than the general population. Breast cancer studies have also demonstrated greater experiences of depression and anxiety than the general

population with 22% of participants in one study reporting depression and 19% reporting anxiety (Khan et al., 2012) and for individuals reporting severe breast cancer greater numbers of individuals reported experiences of depression 38% and anxiety 22% (Vardanima et al., 2010). However these depressive experiences are lower than reported in scleroderma studies.

Gilbert (2007) suggested different types of threat contribute to the development of depression, and that depressed individuals suffer a threat processing deficit, that may have developed as a result of individual differences and stress experiences that have influenced cognitions, emotions, motivation, behaviour and energy levels. Depressed individuals describe feelings of sadness and hopelessness; symptoms include depressed mood, loss of interest or pleasure in activities, fatigue, an increase or decrease in appetite and weight, along with sleep, concentration and psychomotor disturbances, feelings of worthlessness, inappropriate guilt and suicidal thoughts.

Depression often co-occurs with anxiety (APA, 2013), a psychological condition that involves the fight and flight response. Anxiety is described as a normal response to a threatening situation, however when the level of response to a specific event or stressor becomes excessive and the individual experiences difficulty controlling excessive worry in relation to these fears, an anxiety disorder may develop (e.g., Hunt & Jarry, 1997). Individuals may experience symptoms such as fatigue, sleep and concentration problems, irritability and restlessness. Prevalence rates for anxiety disorders range from approximately 1% to 9% in the general population (APA, 2013).

Negative rearing experiences that relate to feelings of threat, attachment stress, adverse life events, genetic predispositions and immune dysfunction have been associated with psychological disorders such as depression and anxiety (Arnetz & Ekman, 2006). Stressful psychosocial environments that elicit a prolonged chronic stress response, may result in inappropriate adaptive responses that interfere with the regulation of the HPA axis (Arnetz &

Ekman, 2006). The development of depression and multiple subtypes of anxiety have been associated with maladaptive responses to prolonged stress, negatively impacting on neural-endocrine and immune interactions, and reducing serotonin receptors involved in the regulation of the anti-stress system (Arnetz & Ekman, 2006). Prolactin an immune-stimulant is also involved in the anti-stress system and was found to be elevated in 80% of scleroderma participants (Vera-Lastra, 2006). Prolactin levels may be affected by stressful environmental conditions (Sobrinho et al., 1998); its secretion affects the central nervous system and influences an individual's emotions and behaviour (Sobrinho et al., 1998; Sonino et al., 2004) and experiences of depression and anxiety (Fava et al., 1981; Sonino et al., 2004).

Depression has been investigated from a number of perspectives in relation to scleroderma. Research suggests depression is associated with threat processing deficits, stress hormones such as cortisol (Gilbert, 2007) and anti-stress hormones such as prolactin in scleroderma samples (Vera-Lastra, 2006). Psychosocial factors associated with depression and anxiety that involve the threat system and stress response, such as a lack of early experiences of warmth and safeness, avoidant and suppressive emotion regulation strategies and self-relating approaches low in compassion; reported in the literature as associated with depression, the most common psychological condition experienced by individuals diagnosed with scleroderma (e.g., Angelopoulos et al., 2001; Roca et al., 1996; Thombs et al., 2007) and breast cancer were explored in this study.

It was anticipated that individuals with more adverse early life experiences and inadequate emotion regulation strategies would experience greater depression and anxiety. It was also anticipated that higher depression and anxiety would be experienced by scleroderma participants, when compared to breast cancer participants; as these results were found in previous scleroderma and breast cancer studies. These studies however were not direct comparisons as is investigated in the current study.

Summary of the Literature and Rationale for the First Study

Scleroderma is a rare and complex autoimmune disease afflicting individuals with a range of symptoms. There is no cure or known cause for scleroderma, although there are many factors that have been associated with this disease. Much of the research has found negative physical, psychological and social implications for those diagnosed with scleroderma (Hyphantis et al., 2007; Malcarne & Greenbergs, 2005; Richards et al., 2004). Psychosocial research has mostly focused on psychological and social variables related to disease severity, coping with and adjustment to a diagnosis of scleroderma and depression. Although people diagnosed with scleroderma appear to suffer a range of psychological problems these factors have not been fully investigated. A few studies have found that stress events were reported before the onset of scleroderma, indicating that disease symptoms may be associated with earlier stressful life events.

Early life stress has been linked to heightened stress in adults, physical illness and pain. Research suggests individuals exposed to childhood stress, experience an increase in physical symptoms that include gastrointestinal, respiratory and other types of pain (Thakkar & McCanne, 1999) and a greater likelihood of developing a serious health problem such as cancer, ulcers or autoimmune diseases (Sachs-Ericsson et al., 2005).

Elevated experiences of pain has been associated with a range of psychosocial problems that include regulating emotions, an insecure attachment style and childhood experiences of stress, and are factors that have not been explored in relation to scleroderma symptoms, pain and disability. Stressful events may occur at any time during the lifespan. Adverse experiences early in life are capable of affecting an individual's adaptive functioning in adulthood, influencing emotional and cognitive responses and capacity to manage stress and distress; factors that may be associated with scleroderma symptoms, disability and experiences of pain.

Gilbert and colleagues (2008) suggest that feeling safe influences, attachment styles, self-evaluative processes and whether psychological disorders develop. Insecurely attached individuals have limited personal and environmental resources and rely on emotion regulation strategies such as avoidance or suppression, that are likely to increase arousal levels and reduce an individual's ability to manage stress (Simpson & Rholes, 1998). Suppression is frequently used to regulate emotional thoughts (Petrie et al., 1998) by decreasing the expression of the emotional experience, however this strategy can result in distorted cognitions and increased physiological responses (Gross, 2002; Hayes et al., 1996). These strategies have the potential to influence physical and psychological health (Petrie et al., 1998), the development of disorders such as depression and anxiety (Iwamitsu et al., 2005) and elevated arousal levels that affect immune functioning associated with autoimmune diseases (e.g., Schore, 1994).

Strategies that provide a more positive emotion regulatory approach, not based on an evaluative process (Neff, 2003a) involving threat (e.g., Gilbert, 2002; 2007), but on kindness and understanding toward the self (Neff, 2003a; Neff et al., 2007), tend to reduce arousal levels and promote well-being. This emotion regulation strategy is associated with lower physiological responses such as cortisol levels and lower scores on psychological measures of distress (Pace et al., 2009). Self-compassion has a negative association with depression, anxiety and thought suppression (Neff et al., 2007).

The literature suggests that psychosocial stressors such as early life stress, depression, and anxiety disorders are implicated in the stress response (Boscarino, 2004; Miller, 2005). Physiological responses associated with the stress response include hyper-arousal (e.g., Schore, 1994), inflammatory conditions, hypertension, constricted blood vessels (Varga, 2004) and immune activation (Seyle, 1950; 1976; Schore, 1994). Developing emotion regulation strategies capable of reducing arousal levels when stressed or distressed are associated with

increased psychological and physiological wellbeing.

As stress events can occur at any time and adverse early life experiences can affect the adaptive functioning of an individual in adulthood and influence physiological functioning, including immune reactions, and emotional and cognitive responses to manage stress; the biopsychosocial factors of early memories of warmth and safeness, attachment style, emotion regulation/copying strategies (self-compassion and suppression), hyper-arousal, depression and anxiety were explored in relation to scleroderma and breast cancer.

CHAPTER THREE: STUDY ONE - THE SCLERODERMA STUDY

Psychosocial Scleroderma Model

The psychosocial scleroderma model (depicted in figure 1 below) developed by the researcher for this study, was based on Gilbert's social mentalities theory, that early environments involving a lack of warmth and safety, influence the development of the threat mentality (e.g., Gilbert et al., 2006). This theory together with the hypothesis that these negative early rearing experiences, generally involve the development of inadequate emotion regulation strategies (such as suppression and low self-compassion) and insecure adult attachment styles (such as dismissive and fearful attachment) are ways of relating to self and others, that fail to reduce arousal. These interpersonal and intrapersonal experiences are hypothesised to be risk factors in the development of psychological disorders, hyper-arousal and scleroderma.

Figure 1 below depicts the model developed for the first study that illustrates the influence negative early relational experiences (EMWS) may have on the development of the threat mentality, reflected in negative inter/intra-personal (e.g., levels of self-compassion and suppression) adult relationships (insecure attachment), psychological conditions (depression/anxiety) hyper-arousal and Raynaud's/scleroderma onset.

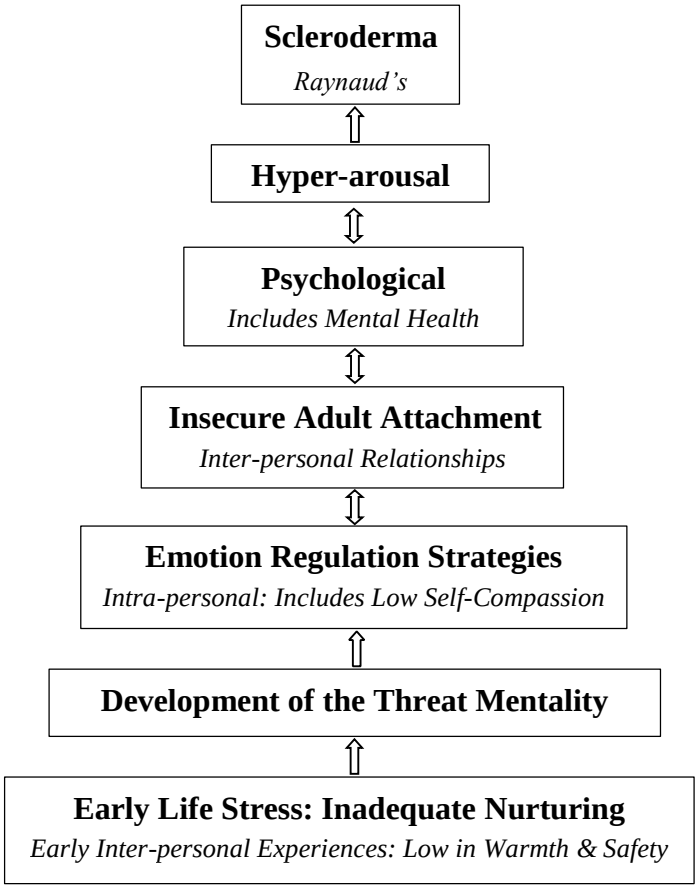

Figure 1: Scleroderma Stress-Arousal Model

Overview of the Research Study

Previous research has found that individuals diagnosed with scleroderma tend to have a co-morbid psychological status and may have experienced stress before or during the onset of scleroderma (e.g., Angelopoulos et al., 2001; Chen et al., 2008; Hyphantis et al., 2007). Although stress is implicated in the first symptom (Raynaud's) of scleroderma (Freedman & Ianni, 1983), limited research has investigated stress in relation to onset and exacerbation of scleroderma symptoms. Previous research has mainly focused on psychological conditions associated with the disease course (e.g., Angelopoulos et al., 2001; Richards et al., 2004; Roca et al., 1996) with a few studies reporting stress events before the onset of this disease (Chen et al., 2008; Hui et al., 2007), without reference to scleroderma symptoms.

Early life stress and the potential long term risk factors associated with hyper-arousal and the development of autoimmunity (e.g., Schore, 1994) have not been examined in relation to scleroderma and may be associated with psychological and physiological conditions, experienced by individuals diagnosed with this disease. As thirty per cent of individuals diagnosed with scleroderma die within the first five years of diagnosis (Varga, 2004), the examination of symptom severity and the relationship with emotion regulation, attachment style and hyper-arousal is of particular interest, as these aspects are associated with immune activation and may increase severity.

To date no study the researcher is aware of has examined stressors associated with affective states of warmth and safety, ineffective emotion regulation strategies and physiological stress aspects of hyper-arousal associated with immune alterations and scleroderma. The study is primarily interested in the relationship between stressful psychosocial issues associated with early life experiences, (affective states of warmth and safety), adult attachment styles (e.g., dismissive and fearful) and emotional regulation (suppression and self-compassion) associated with physiological stress and hyper-arousal, scleroderma disability and specific symptoms (pain, skin, Raynaud's, ulcers, breathing and intestinal conditions) and onset and psychological symptoms (anxiety, depression and stress).

The present study examined the experience of scleroderma within the perspective of the biopsychosocial model of health incorporating the area of psychoneuroimmunology and Gilbert's biopsychosocial theory of social mentalities and affect regulation systems. As differences in both psychosocial and disease symptoms are reported across the scleroderma population, analysis measuring (16 variables) difference between groups such as diffuse and limited sclerosis, specific symptoms such as Raynaud's, No Raynaud's and Pain, no Pain groups etc., involved recording (self-report) responses on a number of psychological (EMWS scale; Self-Compassion Scale; Relationship Scales Questionnaire; Emotion Regulation Scale;

and the DASS) and physiological (e.g., SHAQ; Hyper-arousal Scale) scales. Subscales (e.g., self-kindness; over-identification; fearful and dismissive attachment; suppression; reactive hyper-arousal) were also utilized to measure a broader range of psychosocial and physical variables that could be relevant to difference between groups. To examine the research question of the effects of biopsychosocial variables involving interpersonal and intrapersonal relationships and levels of hyper-arousal on scleroderma symptoms and onset, a set of nine hypotheses involving 16 variables were developed. However it should be noted that the sample size obtained for this study was rather small for the number of variables measured.

Study One: Nine Hypotheses

Hypothesis One: Scleroderma Symptoms - Pain

Hypothesis One: Higher levels of Pain will be associated with higher levels of Raynaud's phenomenon, Scleroderma disability, Intestinal and Breathing problems.

Hypotheses Two: Scleroderma Symptoms - Early Life Experiences

Hypothesis 2(a): Lower levels of EMWS and an insecure attachment style (Dismissive and Fearful) will be associated (in individuals diagnosed with scleroderma) with higher levels of Pain. Hypotheses 2(b): Greater Raynaud's phenomenon, 2(c): Greater scleroderma disability, 2(d): Greater intestinal problems, 2(e): Greater breathing problems and 2(f): More severe finger ulcers.

Hypotheses Three: Scleroderma Symptoms - Emotion Regulation and Hyper-arousal

Hypothesis 3(a): Lower levels of Self-compassion and higher levels of Suppression and Hyper-arousal will be associated (in individuals diagnosed with scleroderma) with higher levels of Pain. Hypotheses 3(b-f): As for hypothesis 3(a) including other specific symptoms other than pain 3(b): Raynaud's phenomenon, 3(c): Scleroderma disability, 3(d): Intestinal, 3(e): Breathing and 3(f): Finger ulcers.

Table 1 below provides a summary overview of the research project.

<table>
<tr><th colspan="2">Table 1 Summary: Overview of Research Project</th></tr>
<tr><th>Study 1: Scleroderma Study</th><th>Study 2: Comparison Study</th></tr>
<tr><td>DV's: Disease Symptoms
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Types of Scleroderma
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<tr><td>IV's Psychosocial Variables
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Early Nurturing Experiences
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Gilbert's Social Mentalities Theory
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<tr><td colspan="2">Stress and Physiological Processes: Rational for Studies
The literature suggests stressful experiences can cause dysregulation of neurological processes, immunological responses and excessive inflammatory reactions involved in autoimmunity and the development of scleroderma.
Investigating factors that involve the threat/stress response and the relationship with disease, may provide a greater understanding of the influence early relational experiences may have on adult ways of relating to self and others and physiological processes that may impact on disease onset and exacerbation of symptoms.
The studies purpose was to provide further evidence for holistic disease treatment.
Recognising that thinking processes may be an important factor in understanding an individual's physiological responding and resulting influence on disease symptoms, may encourage professionals to engage in a more holistic approach to treatment.</td></tr>
<tr><td>Aim
To investigate the link between early relational, interpersonal and intrapersonal relationships and levels of hyper-arousal and self-compassion on scleroderma symptoms and onset.</td><td>Aim
To investigate whether differences occur between groups for relational variables, levels of self-compassion and hyper-arousal to identify whether specific experiences are linked to disease symptoms and onset.</td></tr>
<tr><td>Hypotheses
Greater negative relational experiences will predict greater hyper-arousal, disease severity and earlier onset.</td><td>Hypotheses
The scleroderma group will report more negative experiences than the breast cancer and community groups.</td></tr>
</table>

Hypothesis Four: Age Diagnosed with Scleroderma/Raynaud's - Psychosocial Variables

Hypothesis 4(a): Lower levels of EMWS and Self-compassion, an insecure attachment style (Dismissive and Fearful) and higher levels of Suppression and Hyper-arousal will be associated with an earlier diagnosis of Scleroderma and hypothesis 4(b): an earlier diagnosis of Raynaud's phenomenon.

Hypothesis Five: Diffuse and Limited – Difference in Biopsychosocial Variables

Hypothesis 5(a-h): Individuals diagnosed with diffuse and limited sclerosis who have experienced more negative psychosocial experiences will also report more negative disease outcomes (that will differ across the two groups). The psychosocial variables EMWS, Dismissive and/or Fearful attachment, Suppression, Self-compassion (subscales mindfulness, self-kindness, common humanity, self-judgment, over-identification and isolation) and Hyper arousal (subscales, introspect and reactive) were hypothesised to be associated with the following disease symptoms, each described as an independent hypothesis. Hypotheses 5(a): Psychosocial variables and Pain; 5(b): Raynaud's phenomenon; 5(c): Scleroderma disability; 5(d): Intestinal; 5(e): Breathing; 5(f): Finger ulcers; 5(g): Age Diagnosed with Scleroderma; and 5(h): Age Diagnosed with Raynaud's phenomenon.

Hypothesis Six: Specific Scleroderma Symptoms – Difference in Psychosocial Variables

Hypothesis 6(a): Lower levels of EMWS, Self-compassion, emotion regulation and insecure attachment will also be reported by those individuals diagnosed with Pain when compared with individuals without Pain and (hypotheses) 6(b): Raynaud's phenomenon, 6(c): Intestinal, 6(d): Breathing and 6(e): Finger ulcers (experienced by individuals diagnosed with scleroderma) when compared with individuals diagnosed with Scleroderma without these conditions.

Hypothesis Seven: Scleroderma Skin Involvement –Psychosocial Variables

Hypothesis Seven: Lower levels of EMWS, Self-compassion, an insecure attachment style (Dismissive and Fearful) and higher levels of the negative emotion regulation strategy Suppression will be associated with greater Skin symptoms associated with progression of Scleroderma.

Hypothesis Eight: Depression, Anxiety and Stress – Biopsychosocial Variables

Hypotheses 8(a): Scleroderma - Depression, 8(b): Anxiety and 8(c): Stress will be associated with lower levels of EMWS, Self-compassion, an insecure attachment style (Dismissive and Fearful), higher Suppression, Scleroderma disability and Specific symptoms.

Hypotheses 8(d): Diffuse and Limited sclerosis - Depression, 8(e): Anxiety and 8(f): Stress will be associated with lower levels of EMWS, Self-compassion, an insecure attachment style, higher Suppression, Scleroderma disability and Specific symptoms *Hypotheses 8(g):* Higher levels of Depression, 8(h): Anxiety and 8(i): Stress will be reported by individuals diagnosed with Raynaud's phenomenon, Pain, Finger ulcers, Intestinal and Breathing conditions experienced by individuals diagnosed with scleroderma, when compared to individuals diagnosed with scleroderma without these conditions.

Hypothesis Nine: Hyper-arousal – Biopsychosocial Variables

Hypothesis Nine: Higher levels of Hyper-arousal will be associated with more severe scleroderma symptoms (Pain, Raynaud's phenomenon, Breathing and Intestinal conditions and Finger ulcers), onset of scleroderma at a younger age and psychosocial experiences of low EMWS and Self-Compassion and greater experiences of Suppression and an insecure attachment style (Dismissive and Fearful).

Method

Procedure

A number of scleroderma organisations reaching an international population were involved in promoting this study to members diagnosed with scleroderma. These organisations included the Queensland and Australian Scleroderma Associations and the United Kingdom Scleroderma Society. These non-profit organisations work to provide education and support for members. Approval was received from the various associations' committees responsible for scleroderma research once the survey and explanatory letter had been sighted and discussed.

Participants in Australia were recruited through newsletters published by the Australian, and Australian State Scleroderma Associations, such as Queensland and Victoria and by the research student within South East Queensland (Sunshine Coast, Brisbane and Gold Coast) at scleroderma meetings to complete an online or hardcopy version of the survey. Australian participants who had no online access, received a hardcopy version of the questionnaire. These participants were recruited from phone enquires and emails as a result of advertisements in scleroderma newsletters and magazines or at scleroderma meetings. A questionnaire with a stamped addressed envelope, to the supervisor of this project at Bond University was forwarded to interested participants by mail or handed to participants at meetings.

A written explanatory letter containing information about the purpose, procedure, where questions/complaints could be directed, risks and benefits of the research project and anonymity of participants was attached as a cover page to the online and hardcopy versions, for

participants to view prior to completing the survey. Completion of the survey required approximately 50-60 minutes of the participants time. Information about the study and the survey including a written explanatory letter from both the researcher and the United Kingdom Scleroderma Society was forwarded by the trustee of the Scleroderma Society to 231 of their members that had been diagnosed with Scleroderma. The project was approved by the Bond University Human Research Ethics Committee and received approval from the Scleroderma Society Ethics Committee in the United Kingdom and the Queensland and Australian Scleroderma Associations.

Participants

Male and female adults aged 18 years and over diagnosed with scleroderma were invited to participate in this research project. Participants were asked a number of demographic and health questions, ranging from general questions such as the country they resided in, gender, current age and age diagnosed with scleroderma to questions relating to participants physical symptoms, such as degree of skin involvement and psychological health (e.g., diagnosed with a mental health disorder before and/or after diagnosis of scleroderma).

Males were recruited with regard to the scleroderma prevalence rates for females and males. Similar to other connective tissue diseases, scleroderma has a greater incidence in females with predominance of 3-5:1, and up to 14:1 in some female populations (Chifflot et al., 2008). Therefore a much smaller percentage of males were recruited for this project. Significant differences between physiology for males and females are also noted for example estrogen tends to feature as a predisposing factor in both autoimmune diseases and breast cancer (Cutolo et al., 2006; Eeles et al., 2004; Mavaddat et al., 2010) and may partially explain the high prevalence in women when compared to men.

Measures

Psychosocial Stress: Warmth and Safeness

Early Memories of Warmth and Safeness Scale. The EMWS scale is a 21 item self-report, 5 point Likert scale (e.g., 0 = no, never, 2 = yes sometimes and 4 = yes most of the time). Items include, “I felt safe and secure”. “I felt a sense of belonging,” “I felt cared for.”

This scale assesses emotional memories of an individual's childhood as a measure of preverbal or nonverbal experiences of stress. The EMWS scale focuses on recall of one's own emotional experiences while most other measures focus on recall of others behaviours; recall of positive emotions (or deficits) was found to be a better predictor of psychopathology and styles of self-criticism than recall of parental behaviour. The EMWSS has good psychometric properties (high Cronbach's alpha, retest reliability, divergent and predictive validity). "Recall of parental behaviour and recall of positive emotional memories were highly related, but recall of positive emotional memories was a better predictor of psychopathology, styles of self-criticism/self-reassurance and disposition to experience positive affect, than recall of parental behaviour" (Richter, Gilbert & McEwan, 2009).

Attachment: Relationship Scale Questionnaire (RSQ)

The Relationship Scale Questionnaire (Griffin & Bartholomew, 1994) comprises 30 items each rated on a 5 point Likert scale, (e.g., 1 = not at all like me, 3 = somewhat like me, and 5 = very much like me). This self-report measure was developed to assess a number of insecure anxious-avoidant attachment styles such as anxious-pre-occupied, dismissive-avoidant, fearful-avoidant and a secure attachment style. Examples of items include, "I find it difficult to depend on other people" (fearful attachment). "It is important for me to feel independent" (Dismissive). "I find it easy to get emotionally close to others." (secure). "I want to merge completely with another person" (preoccupied). The questionnaire has good internal consistency ranging from .85 to .90 (Griffin & Bartholomew, 1994). This scale has good psychometric properties (test-retest reliability and internal consistency, convergent, discriminant and predicitive validity (Ravitz, Maunder, Hunter, Sthankiva & Lancee, 2010).

Emotional Regulation: Suppression and Re-appraisal

Emotional Regulation Questionnaire (ERQ; Gross & John, 2003). ERQ is a 10 item 7 point Likert type scale (1 = strongly disagree; 4 = neutral; 7 = strongly agree), self-report measure of thought suppression, a regulatory strategy that prevents the expression of the true felt emotion; and reappraisal the ability to re-evaluate a situation in a more positive way. Examples of items include, "When I am feeling positive emotions, I am careful not to express them" and "When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm". The ERQ has satisfactory alpha reliability and test-retest reliability and is a valid measure of suppression and reappraisal (Gross & John, 2003).

Self-Compassion: Self Compassion Scale

The Self Compassion Scale (Neff, 2003) is a 26 item, self-report, emotion regulation measure that employs a 5 point Likert scale (e.g., 1 = almost never to 5 = almost always) that contains three components. Self-kindness/Self-judgment (being kind and understanding toward oneself rather than judgmental or critical); Common humanity/Isolation (viewing one's negative experiences as a normal part of the human condition rather than experiencing suffering in isolation); and Mindful acceptance/Over-identifying (being open to and accepting of one's situation rather than over-identifying with painful thoughts and feelings). Examples of items include, "When things are going badly for me, I see the difficulties as part of life that everyone goes through." "When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world." "I try to be loving towards myself, when I'm feeling emotional pain." "When I fail at something important to me, I become consumed by feelings of inadequacy." "When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people." This scale has good psychometric properties (construct, content, convergent and discriminant validity; test-retest reliability) and

is a valid theoretical measure of self- compassion (Neff, 2003). Self-compassion may be an adaptive process that increases psychological resilience and well-being (Neff, 2003).

Psychological: Depression, Anxiety and Stress Scale

The Depression, Anxiety and Stress Scale (DASS21; Lovibond & Lovibond, 1995). The DASS21 is a 21 item 4 point likert scale, self-report measure of Depression, Anxiety and Stress. The DASS21 provides useful clinical information of depression and related problems of anxiety and stress that allows for discrimination amongst the variables. In research the DASS21 provides a dimensional assessment of three forms of negative affect with minimal levels of overlap among these variables (Nezu, Ronan, Meadows, & McClure, 2002). Participants indicate either, 0, 1, 2 or 3 which specifies how much the statement applied to them over the past week. Examples of items include "I found it hard to wind down" and "I couldn't seem to experience any positive feelings at all." The DASS21 is a quantitative measure of distress along the axes of depression, anxiety (symptoms of psychological arousal) and stress (the more cognitive, subjective symptoms of anxiety). It has good reliability and adequate convergent and discriminant validity (Crawford & Henry, 2003).

Physiological: Scleroderma Questionnaire

Scleroderma Health Assessment Questionnaire (SHAQ). Scleroderma disability was measured using the Scleroderma Health Assessment Questionnaire (SHAQ; Fries, Spitz, & Young, 1978; Steen & Medsger, 1997). The SHAQ provides a disability index measuring eight areas of functioning including arising, dressing, grooming, hygiene, eating, walking, reach, grip and activity and is used to measure severity of disability. Item responses range from 0, which indicates without any difficulty to 3 indicating unable to do. The index contains questions such as, "are you able to open jars previously opened?" Specific scleroderma related symptoms of pain, Raynaud's, finger ulcers, breathing and intestinal problems were measured using an analogue visual scale ranging from 0, indicating no limitation to 100, indicating very

severe limitation. The SHAQ has good psychometric properties (incremental, face and content validity and satisfactory reliability construct, concurrent, and predictive validity: Johnson, Hawker, & Davis, 2005).

Arousal: Hyper-arousal Scale

The Hyper-arousal Scale (Hammond, Barsky, & Regestein, 2001) is a 26 item self-report that measures tendencies to introspect think about feelings; responding intensely to unexpected stimuli and other behaviours that involve cortisol arousal. Responses to each item on the Hyper-arousal Scale are graded from 0 to 3 respectively where 0 = not at all, 1 = a little, 2 = quite a bit and 3 = extremely. Hyper-arousal scale scores correlate with several EEG measures of arousal including frequency spectral and evoked potential measures. Hyper-arousal scores signify increased general cerebral responsiveness but decreased selective attention, indicating openness to stimuli and difficulty distinguishing between physiologically harmless and threatening sensations. This situation may create an information overload and result in difficulty adapting to recurring stimuli. A decrease in selective attention may create ambiguity as to the meaning attributed to the perceived experience resulting in the development of an adversity management system. The scale contains questions involving "Bright lights & crowds and thinking a lot about feelings." This scale has good psychometric properties (predictive and construct: Hammond, Barsky, & Regestein, 2001). Participants recorded responses to 26 questions related to how they would respond in certain situations.

Results

Study One: Overview of Analysis

Analysis was performed using SPSS version 18 and descriptive statistics for each of the continuous variables was obtained. Frequencies were investigated for demographic and health information. Multiple regression assumptions were explored as these analyses were considered appropriate to meet the initial hypotheses. Bivariate correlation analyses using Pearson's

product-moment correlation coefficient were conducted between reliable and normally distributed or transformed scales and subscales, to establish the relationship between the dependent variables, scleroderma disability, pain, intestinal, breathing and Raynaud's and the independent variables, early memories of warmth and safeness (EMWS), attachment style (RS), emotion regulation (ER), hyper-arousal and self-compassion (SC). T-Tests were also conducted to determine significant mean differences between the major types of Scleroderma, Diffuse and Limited Sclerosis and psychological variables. Demographic and health variables such as gender, age, education, marital status, age diagnosed with scleroderma and age diagnosed with Raynaud's were also investigated in relation to psychological variables, pain, disability and severity of specific scleroderma symptoms.

Preliminary Statistical Analysis

Age: Frequencies for current age revealed the age range for participants at between 26 and 80 years, with a mean age of 56 years.

Demographic: Frequencies for demographic information revealed a total of 129 participants, 96 (93%) females and nine (7%) males with 24 participants failing to complete this information. Thirty four (26%) participants were from Australia, 69 (54%) from the UK and two (2%) from European Countries, 24 (18%) participants did not supply this information.

Education: Three participants reported gaining a primary school education, 46 (44%), reported a secondary school education, with 34 (33%) and 21 (20%) participants respectively reporting tertiary and post graduate education, (25 participants did not supply this information).

Health: for health information revealed 35 (45%) participants were diagnosed with diffuse sclerosis and 43 (55%) reported a diagnosis of limited sclerosis, (51 individuals did not complete this information). The age range for individuals when first diagnosed with scleroderma was 20 to 72 years, with a mean age of 47 (SD, 11.34). Seventy two (96%)

participants reported a diagnosis of Raynaud's while five (4%) participants were not affected by Raynaud's, (41 participants did not complete this information). The age range for individuals when they were first diagnosed with Raynaud's was 20 to 72; the mean age was 47 years (SD 11.52). Missing data was evident throughout the data. The pattern appeared random for all completed scales. A large number of participants had completed demographic, health and Scleroderma scales but had failed to complete psychological scales. Some participants completed only the Depression Anxiety and Stress Scale (DASS) while completion of the remainder of the psychological scales varied with each participant. A number of participants failed to specify type of Scleroderma or did not indicate a diagnosis of Scleroderma, these participants were excluded from the study. One hundred and twenty nine individuals participated in the study; with the exclusion of cases to meet assumptions and hypotheses criteria, a total of 92 participants remained. The EMWS scale (childhood warmth and safety) was positioned after the first psychological scale in the questionnaire (the DASS); revisiting these experiences may have led to a number of withdrawals from the survey.

It can be difficult for people to complete questionnaires containing this type of material and therefore three sources of psychological support as mentioned on page eight were provided on the first page of the survey. Equally participants may have had no interest in completing the psychological scales as they have felt they had no psychological issues and therefore these scales were not relevant to them. If participants positive or negative reasons for non-responding were relatively even then the issue of missing data may not be an issue.

Reliability – Internal Consistency

Analysis revealed Cronbach's alpha coefficients for the variables Depression, EMWS, Self-Kindness and the SHAQ were above .90. Stress, Reappraisal, Hyper-arousal, Self-Judgment, Common Humanity and Mindfulness were above .80. Self-Compassion, Fearful attachment, Suppression, Isolation, Over-identification and Anxiety were .70, or above. Two subscales with

a small number of items had alpha coefficients below .70. Dismissive attachment had 5 items and an alpha coefficient of .65; the mean inter-item correlation was calculated (and found to be within the acceptable range of .20 and .40; Briggs and Cheek, 1986) at .28. Reactive Hyper-arousal had 3 items and an alpha coefficient of .52 with an acceptable inter-item correlation mean of .26. The variables preoccupied and secure attachment were below .30 demonstrating low internal consistency and were removed from further analysis.

Multiple Regression Analysis for Scleroderma Symptoms

Data was screened for suitability for multiple regression analysis. The assumptions for normality were met for EMWS, Suppression and Reappraisal subscales of the ERQ, the Self-compassion Scale, and subscales Self-kindness, Mindfulness, Common Humanity, Self-judgment, Over-identification and Isolation and the Stress subscale of the DASS. The SHAQ disability scale, Pain, Intestinal, Breathing and Raynaud's subscales, Hyper-arousal, Introspect and Reactive Hyper-arousal subscales, Fear subscale of the RQ, the Anxiety and Depression subscale of the DASS were positively skewed. Examination of plots revealed univariate and multivariate outliers for two cases, which were removed as recommended by Tabachnick and Fidell (2007). Square-root, logarithm and inverse (reflect for negatively skewed) transformations were conducted according to the shape of the distribution for each of the variables: transformation, however, did not reduce the skew.

Data was then organised into the two major types of Scleroderma (Diffuse sclerosis and Limited sclerosis) and skin related Scleroderma, Morphea (four participants), Localised (two participants) Sclerosis and overlap conditions (eight participants). In an attempt to normalise the data the skin related and other groups (14 participants) were excluded from the data leaving the two major types of Scleroderma: Diffuse and Limited. The skew for these variables was reduced and closer to zero meeting the assumptions for normality. A total of 78 participants remained for analysis. The data was checked for multicolinarity among the predictor variables

and it was found that the correlations among the predictor values were below r < .9 therefore meeting this assumption. The assumptions for independence, singularity, linearity and homoscedasticity were generally met (unless otherwise discussed). Pearson's bivariate correlations, t-tests, multiple regression and MANOVA analyses were conducted to investigate the nine hypotheses: that lower levels of EMWS, inadequate emotion regulation strategies (lower self-compassion and higher suppression) and an insecure attachment style (dismissive and fearful) would be associated with higher levels of disability pain, and specific scleroderma symptoms (Raynaud's phenomenon, finger ulcers, skin, intestinal and breathing conditions) in individuals diagnosed with scleroderma. Pain was also explored in relation to scleroderma symptoms and was hypothesised to be associated with higher levels of specific scleroderma symptoms. Comparisons between the two major forms of scleroderma (diffuse and limited sclerosis), specific scleroderma symptoms (Raynaud's phenomenon, finger ulcers, skin, intestinal and breathing conditions), age of diagnosis (with scleroderma) and psychosocial variables were examined to determine the relationship between biological (severity of scleroderma symptoms) and psychosocial factors (insecure attachment, emotion regulation and early life experiences). Mental health aspects (depression, anxiety and stress) were explored in relation to these biopsychosocial aspects to determine the level of contribution these factors made to scleroderma symptom severity.

The hypotheses were divided into four headings. Hypotheses 1-3: Scleroderma symptoms and psychosocial variables. Hypothesis 4: Age diagnosed with scleroderma and Raynaud's phenomenon and psychosocial variables. Hypothesis 5-7: Specific scleroderma symptoms (e.g., diffuse/limited, pain, Raynaud's and skin involvement) and psychosocial variables. Hypothesis 8-9: Mental health (e.g., depression and anxiety), psychosocial and scleroderma variables. Hyper-arousal, psychosocial and scleroderma.

Hypotheses 1-3: Scleroderma Symptoms and Psychosocial Variables

Hypothesis One: Scleroderma Symptoms and Pain

Pearson's bivariate correlations were conducted after the assumptions for multiple regression were met for the scleroderma sample (consisting of individual's with diffuse and limited sclerosis). Results partially supporting the first hypothesis revealed meaningful relationships between Pain and Raynaud's (r = -.31, p = .007), Intestinal (r = .58, p = .000), Breathing (r = .35, p = .002), and Scleroderma Disability (r = .49, p = .000); these variables were entered into a multiple regression analysis to determine the first hypothesis. The results for the scleroderma sample (diffuse/limited) demonstrated the variables significantly accounted for 68.8% (Adjusted R^2 = 44.2%) of the variance, $F(4, 69) = 15.48$, p = .000, in

Pain associated with Scleroderma. The regression coefficients demonstrated that Intestinal (β = .45, p = .000, sr^2 = 16.9%) and Scleroderma Disability (β = .33, p = .001, sr^2 = 9.2%; power was calculated at .99; Soper, 2011) were significant predictors of Pain.

Hypotheses Two: Scleroderma Specific Symptoms and Early Life Experiences

Hypothesis 2(a): Pain and Psychosocial Variables, EMWS and Attachment

Pearson's bivariate correlations were conducted to determine hypothesis 2(a), that EMWS and an insecure attachment style would predict greater pain in the scleroderma sample (consisting of individual's with diffuse and limited sclerosis). Results supporting the hypothesis revealed meaningful relationships between Pain and EMWS (r = -.37, p = .002), and Dismissive attachment style (r = .28, p = .017). Variables were entered into multiple regression analysis to determine the first hypothesis: Higher levels of Pain would be associated with lower levels of EMWS, and an Insecure Attachment Style, in individuals with scleroderma (diffuse/limited). The results demonstrated the variables significantly accounted for 43.7% (Adjusted R^2 = 16.7%) of the variance, F (2, 68) = 8.04, p = .001 in Pain related to

Scleroderma Symptoms. The regression coefficients demonstrated that EMWS (β = -.34, p = .003, sr^2 = 11.2%) and Dismissive attachment (β = .24, p = .032, sr^2 = 5.7%; power was calculated at .93, Soper, 2010), were significant unique predictors of Pain experienced by individuals diagnosed with Scleroderma. Results for predictor variables for Pain are presented in Table 2.

Table 2

Summary of the Multiple Regression Analysis for Scleroderma Pain N = 70

Variable		*B*	*SEB*	β
Pain				
EMWS		- .36	.12	-.34**
Dismissive Attachment		1.45	.66	.24*
Total R2	.19**			

*p < .05 **p < .01 ***p < .001

The remaining specific scleroderma symptoms Hypotheses 2 (b, c, d, e & f) were not significantly related to EMWS or attachment style and detailed tables are not presented here.

Hypothesis Three: Specific Symptoms, Emotion Regulation and Hyper-arousal

Hypothesis 3(a): Pain, Emotion Regulation and Hyper-arousal

Pearson's bivariate correlations were conducted, to determine the relationship between Pain and psychosocial variables, Self-compassion, Suppression and Hyper-arousal. Results revealed no meaningful relationships between the dependent variable Scleroderma Pain and psychosocial variables therefore the hypothesis 3(a) was not supported.

Hypothesis 3(b): Raynaud's phenomenon, Emotion Regulation and Hyper-arousal

Pearson's bivariate correlations demonstrated meaningful relationships between the dependant variable Raynaud's phenomenon and the independent variables, Self-compassion, (r = -30, p = .021) and Hyper-arousal (r = .25, p = .041). Multiple regression analysis revealed the Scleroderma sample (consisting of individual's with diffuse and limited sclerosis) demonstrated the variables significantly accounted for 45.5% (Adjusted R^2 = 18.3%) of the variance, $F(2, 65) = 8.49$, p = .001 in Raynaud's associated with a diagnosis of Scleroderma. The regression coefficients demonstrated that neither variables were significant predictors of Raynaud's phenomenon.

Pearson's bivariate correlations for the subscales of Self-Compassion and Hyper-arousal were explored to determine whether these variables predicted Raynaud's. Correlation coefficients revealed that Reactive Hyper-arousal (r = .36, p = .003), and Self-Kindness (r = -.35, p = .003) were the highest significant subscales for the variables. Significant variables were entered into multiple regression analysis. The results demonstrated the variables significantly accounted for 45.5% (Adjusted R^2 = 18.3%) of the variance, F (2, 65) = 8.49, p = .001, in Raynaud's associated with Scleroderma Symptoms.

The multiple regression coefficients demonstrated that (the subscales of self-compassion and hyper-arousal) Self-Kindness (β = -.29, p = .014, sr^2 = 7.7%) and Reactive Hyper-arousal (β = .30, p = .012, sr^2 = 8.2%; (power was calculated at .97) were significant unique predictors of Raynaud's phenomenon, experienced by individuals diagnosed with Scleroderma; partially supporting hypothesis 3(b).

Results are presented in Table 3.

Table 3

Multiple Regression Analysis Summary for Scleroderma/Raynaud's and Psychosocial N = 67

Variable		*B*	*SEB*	*β*
Raynaud's Phenomenon				
Self-Kindness		- 42.82	17.04	-.29*
Hyper-arousal Reactive		2.85	1.01	.30*
Total R2	.21**			

*$p < .05$ **$p < .01$ ***$p < .001$

Hypothesis 3(c): Scleroderma Disability, Emotion Regulation and Hyper-arousal

Pearson's bivariate correlations revealed a meaningful relationship between the dependent variable Scleroderma disability and Reactive hyper-arousal ($r = .27$, $p = .025$); indicating that individuals with higher levels of Reactive hyper-arousal may experience greater Scleroderma disability, partially supporting hypothesis 3(c).

Hypothesis 3(d & e): Remaining Specific Symptoms, Emotion Regulation & Hyper-arousal

Hypotheses 3(d & e) were not met as Pearson's bivariate correlation coefficients revealed no meaningful relationships for the specific Scleroderma symptoms; Breathing and Intestinal and psychosocial variables for the total Scleroderma sample. Pearson's bivariate correlations for hypothesis 3(f): Finger ulcers, were not conducted due to skewed distribution.

Hypothesis Four: Age Diagnosed - Scleroderma/Raynaud's & Psychosocial Variables

Hypothesis 4(a): Age Diagnosed-Scleroderma (diffuse/limited) & Psychosocial Variables

Pearson's bivariate correlations and multiple regression analysis were conducted to address hypothesis 4(a); the earlier an individual is diagnosed with Scleroderma the greater the likelihood they would report lower levels of Self-compassion, early memories of warmth and safeness, an Insecure Attachment Style and higher levels of Suppression and Hyper-arousal. Correlation coefficients revealed meaningful relationships between the dependant variable Age diagnosed with Scleroderma and the independent variables, Hyper-arousal (r = -.37, p = .003), and the negative Self-compassion subscales, over-identification (r = -.39, p = .001) and isolation (r = -.25, p = .044) in the scleroderma sample (consisting of individual's with diffuse and limited sclerosis).

Results for multiple regression analysis demonstrated the variables significantly accounted for 42.4% (Adjusted R^2 = 13.8%) of the variance, F (3, 59) = 4.31, p = .008, in Age diagnosed with Scleroderma. Although the model was significant and accounted for 14% of the variance, the regression coefficients demonstrated that no variable was a significant unique predictor of Age diagnosed with Scleroderma. Therefore hypothesis 4(a) was only partially supported.

Hypothesis 4(b): Age Diagnosed with Raynaud's Phenomenon and Psychosocial Variables

Pearson's bivariate correlations and multiple regression analysis were conducted to address hypothesis 7(b); the earlier an individual is diagnosed with Raynaud's phenomenon the more likely they will experience lower levels of Self-compassion, EMWS, an Insecure Attachment Style and higher levels of Suppression and Hyper-arousal. Correlations revealed meaningful relationships between the dependant variable Age diagnosed with Raynaud's phenomenon and the dependent variables (Self-compassion subscales) over-identification

(r = -.48, p = .003) and isolation (r = -.41, p = .014). Multiple regression analysis results demonstrated the variables significantly accounted for 42.1% (Adjusted R^2 = 12.7%) of the variance, F (2, 59) = 4.36, p = .010, in Age diagnosed with Raynaud's. The regression coefficients demonstrated that neither variable was a significant unique predictor of Age diagnosed with Raynaud's phenomenon. Therefore hypothesis 4(b) was partially supported.

Hypothesis 5-7: Specific Scleroderma Symptoms & Psychosocial Variables

Hypothesis 5(a): Diffuse & Limited - Pain & Psychosocial Variables

A split file for Diffuse and Limited sclerosis was used to address hypothesis 5(a): individuals diagnosed with Diffuse and Limited sclerosis would report different psychosocial variables (EMWS, Insecure Attachment, Self-Compassion, Emotion Regulation, Hyper-arousal and Age diagnosed) that predict Pain. Pearson's bivariate correlations were obtained after the assumptions for multiple regression analysis were met. Results significant at .01 revealed meaningful relationships for Pain and EMWS, (r = -.48, p = .002), Dismissive attachment style, (r = .43, p = .006), and Age diagnosed with scleroderma (r = .43, p = .006), for the Limited group and Suppression (r = -.59, p = .001), for the Diffuse group.

Significant variables were entered into multiple regression analysis separately for the Limited sclerosis group as a split file produced warnings that not all statistics could be computed. The only significant correlation coefficient for the Diffuse group was emotional Suppression; therefore, multiple regression analysis was not conducted. The results for the Limited sclerosis group demonstrated the variables significantly accounted for 77.5% (Adjusted R^2 = 56.6%) of the variance, F(3, 35) = 17.49, p = .000, in Pain associated with Scleroderma symptoms. The regression coefficients for the Limited sclerosis group demonstrated that Age diagnosed with scleroderma (β = .51, p = .000, sr^2 = 22.8%), Dismissive attachment (β = .48, p = .000, sr^2 = 20.6%) and EMWS; (β = -.35, p = .003, sr^2 = 11.7%; power .99) were significantly predictive of Pain, experienced by individuals

diagnosed with Limited sclerosis.

Results indicated that individuals diagnosed with Limited sclerosis who reported fewer early life experiences of warmth and safety, an insecure dismissive attachment style and a later diagnosis of scleroderma, were likely to experience greater levels of Pain.
Suppression was associated with greater Pain for the Diffuse group. Therefore differences were found between groups for the variables related to Pain. Results for the Limited group are presented in Table 4.

Table 4

Summary of Multiple Regression Analysis for Split File Limited Sclerosis and Pain N =38

Variable	*B*	*SEB*	*β*
Pain - Limited Sclerosis			
Age Diagnosed Scleroderma	71.66	16.40	.51***
Dismissive Attachment	2.64	.62	.48**
EMWS	-.43	.14	-.35**
R2	.60***		

*$p < .05$ **$p < .01$ ***$p < .001$

Results partially supported hypothesis 5(a) and demonstrated that differences occurred (between the two major types of scleroderma: Diffuse and Limited sclerosis) in variables related to pain; with higher emotional Suppression associated with elevated Pain, for individuals diagnosed with Diffuse sclerosis and lower EMWS, an insecure Dismissive attachment style and a later diagnosis of scleroderma, predicting elevated pain in the Limited

sclerosis group.

Hypothesis 5(b): Diffuse & Limited - Raynaud's Phenomenon & Psychosocial Variables

A split file for Diffuse and Limited Sclerosis groups was also utilized to determine hypothesis 5(b): individuals diagnosed with diffuse and limited sclerosis will report a difference in psychosocial variables EMWS, Dismissive and Fearful attachment, Self-compassion, Suppression and Hyper-arousal associated with Raynaud's phenomenon (subscales of the self-compassion scale: mindfulness, self-kindness, common humanity, self-judgment, over-identification and isolation and hyper-arousal subscales: introspect and reactive, were also investigated as the full scales of these variables were not significantly related to Raynaud's).

Pearson's bivariate correlations were performed to determine difference between groups (Diffuse and Limited sclerosis) for the dependant variable Raynaud's phenomenon and psychosocial variables. Correlation coefficients significant at .01 (small sample) revealed Hyper-arousal Reactive (r = .52, p = .003) and Self-kindness (r = -.55, p = .002), were significantly related to Raynaud's for the Diffuse group; the only significant variable associated with Raynaud's phenomenon for the Limited group was Self-judgement (r = .38, p = .021), therefore results demonstrated differences between groups.

Significant variables for the Diffuse sclerosis group were entered into multiple regression analysis. Results demonstrated that the variables significantly accounted for 65.3% (Adjusted R^2 = 38.5%) of the variance, $F(2, 28) = 10.38$, p = .000, in scleroderma disability resulting from Raynaud's phenomenon, experienced by individuals diagnosed with Diffuse sclerosis. The regression coefficients demonstrated that low Self-kindness (β = .42, p = .010), sr^2 = 15.8%, and Reactive hyper-arousal (β = .38, p = .018), sr^2 = 14.4% (power was calculated at .98), were significant unique predictors of Raynaud's disability experienced by individuals diagnosed with Diffuse sclerosis.

Results demonstrated differences between scleroderma groups, in that individuals diagnosed with Diffuse sclerosis experienced low Self-kindness and Reactive hyper-arousal; whereas those diagnosed with Limited sclerosis experienced greater Self-judgment in relation to the severity of Raynaud's phenomenon experienced. Therefore hypothesis 5(b) was partially supported. Results are presented in Table 5.

Table 5

Summary of Multiple Regression Analysis for Split File Diffuse N = 30, and Raynaud's

Variable	*B*	*SEB*	*β*
Raynaud's Phenomenon			
Diffuse Sclerosis			
Self-Kindness	66.82	24.01	-.42*
Hyper-arousal Reactive	4.20	1.68	-.38*
R2	0.43***		

*$p < .05$ **$p < .01$ ***$p < .001$

Hypothesis 5(c): Diffuse & Limited - Scleroderma Disability & Psychosocial Variables

A split file and correlations were also conducted for the Diffuse and Limited groups to determine hypothesis 4(c). Results for the Limited group revealed no significant relationship between psychosocial variables and Scleroderma disability. Results for the Diffuse group revealed that lower Self-kindness (r = -.44, p = .015), was the only significant variable associated with higher levels of Scleroderma Disability. These results demonstrated differences

between groups, in that individuals diagnosed with Diffuse sclerosis who were less likely to engage in Self-kindness were more likely to experience greater Scleroderma disability. While this emotion regulation strategy was not significantly related to Scleroderma disability in the Limited group; supporting hypothesis 5(c).

Hypothesis 5(d): Diffuse & Limited - Breathing & Psychosocial Variables

Pearson's bivariate correlations for the total scleroderma sample revealed no meaningful relationships between psychosocial variables and Breathing. A split file and Pearson's bivariate correlations were utilized to determine differences between the Diffuse and Limited groups to address hypothesis 5(d). Correlation coefficients revealed that Suppression (r = -.36, p = .045) for the Diffuse group and Common Humanity (r = .35, p = .042, a subscale of Self-compassion) for the Limited group were significantly related to Breathing problems. Results demonstrated differences between groups in that individuals diagnosed with Diffuse sclerosis who experience greater levels of Suppression were more likely to suffer elevated Breathing problems. Whereas individuals with Limited sclerosis reporting greater Breathing problems were likely to experience higher levels of Common Humanity. Results partially supported hypothesis 5(d).

Hypothesis 5(e): Diffuse & Limited - Intestinal Conditions & Psychosocial Variables

A split file and correlation analysis was conducted to determine hypothesis 5(e) for the Diffuse and Limited sclerosis groups for the dependent variable Intestinal. Pearson's bivariate correlations revealed no meaningful relationships for the Limited group between the dependent variable Intestinal and psychosocial variables. Correlation coefficients however, revealed a meaningful relationship for the Diffuse group between Intestinal and Suppression (r = - .42, p = .020); indicating that individuals diagnosed with Diffuse sclerosis who reported experiencing higher levels of Suppression, were more likely to experience greater Intestinal problems. The Limited group did not report this association therefore hypothesis 5(e) was

partially supported; differences between groups do occur in relation to Intestinal conditions. Correlations for hypothesis 5(f): Finger ulcers, were not conducted due to skewed distribution.

Hypothesis 5(g): Diffuse & Limited - Age Diagnosed & Psychosocial Aspects

A split file and Pearson's bivariate correlation coefficients revealed a significant relationship (Diffuse sclerosis group) between Age diagnosed with scleroderma and (low self-compassion) Over-identification (r = .49, p = .006). Hyper-arousal (r = .38, p =.045), was also significantly related to Age diagnosed with scleroderma for the Limited sclerosis group. Results for multiple regression analysis demonstrated the variables significantly accounted for 49.6% (Adjusted R^2 = 18.8%) of the variance, $F(2, 26) = 4.25$, p = .025, in Age diagnosed with Scleroderma. The regression coefficients demonstrated that neither variable was a significant unique predictor of Age diagnosed with scleroderma. Therefore hypothesis 5(g) was partially supported.

Hypothesis 5(h): Diffuse & Limited - Age Diagnosed (Raynaud's) & Psychosocial Aspects

A split file and correlation coefficients revealed a significant relationship for Age diagnosed with Raynaud's for the Diffuse group and Over-identification (r = -.55, p = .015). Results indicated that the younger an individual with Diffuse sclerosis is diagnosed with Raynaud's phenomenon the more likely they would over-identify with their experiences; whereas for the Limited group, Dismissive attachment (r = -.63, p = .005) and Suppression (r = -.50, p = .041) were both significantly related.

Significant variables for the Limited group were placed into a multiple regression analysis; results demonstrated the variables significantly accounted for 96.4% (Adjusted R^2 = 92.0%) of the variance, $F(2,14) = 93.05$, p = .000, in Age diagnosed with Raynaud's phenomenon. The regression coefficients demonstrated that Dismissive attachment (β = -.77,

p = .000, sr ² = 5.0%) and Suppression (β = -.87, p = .000, sr^2 = 5.8%) were both significant unique predictors of Age diagnosed with Raynaud's for the Limited sclerosis group, (power was calculated at .99).

Multicolinarity violated assumptions with both variables indicating scores above .9; therefore results should be viewed with caution, however, a strong correlational relationship was found. These result demonstrate that the younger a Limited sclerosis participant was diagnosed with Raynaud's, the more likely they would utilize the emotion regulation strategy suppression and engage in a dismissive style of relating to attachment figures. Both these variables involve avoidant emotion regulation strategies and provide partial support for hypothesis 5(h).

Hypothesis Six: Difference in Scleroderma Specific Symptoms & Psychosocial Variables

Hypothesis 6(a): Specific Symptoms – Pain/No Pain & Psychosocial Variables

T-Tests and a MANOVA were utilized to address hypothesis 6(a): individuals experiencing Pain and individuals without Pain would report a difference in levels of EMWS, attachment style and emotion regulation strategies (Self-compassion and Suppression). T-tests revealed significant mean differences for the independent variables EMWS for the Pain group (M = 62.76, SD = 26.32) and the No Pain group, M =78.28, SD = -18.49; t (67) = -2.91, p = .005, the magnitude of the mean difference = .85, 95% CI: 4.89 to 26.17 (eta Squared = .12), Dismissive attachment for the Pain group (M = 16.58, SD = 3.91) and the No Pain group, M =14.32, SD = -4.40; t (70) = -2.31, p = .024, the magnitude of the mean difference = .85, 95% CI: -4.21 to -.30 (eta Squared = .07), demonstrating that individuals, in the Pain group reported lower levels of EMWS, and a tendency toward a Dismissive Attachment Style when compared with the No Pain group.

Significant variables were placed into a multivariate analysis of variance to investigate differences in the independent variables EMWS, and Dismissive Attachment for the Pain and

No Pain groups. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance, covariance matrices and multicollinarity; Levene's was significant at .017 for EMWS, indicating a violation in the assumption of equality of variance. Therefore a more conservative alpha level of .025 (as suggested by Tabachinick & Fidell, 2007) was set to determine the significance level for the univariate F-test. There was a statistically significant difference between individuals with and without Pain on the combined dependant variables, Wilks Lambda F (2, 67) = 6.18, p = .003. When the results for the dependent variables were considered separately both EMWS F (1, 68) = 7.46, p = .008, partial eta = .10 and Dismissive Attachment F (1, 68) = 5.84, p = .018, partial eta = .08 were significant. Inspection of mean scores indicated that individuals in the Pain group (M = 63.04, SD = 26.61) reported lower levels of EMWS than individuals in the No Pain group (M = 78.28, SD = 18.49) and higher levels of Dismissive Attachment (M = 14.16, SD = 4.48), than the No Pain group (M = 16.58, SD = 3.91). Therefore results partially supported hypothesis 6(a).

Hypothesis 6(b): Specific Symptoms – Raynaud's/No Raynaud's & Psychosocial Variables

T-Tests and a MANOVA were performed to address hypothesis 6(b): individuals diagnosed with Raynaud's phenomenon compared to individuals without a diagnosis of Raynaud's phenomenon will report lower levels of EMWS, an insecure Attachment Style, Emotion Regulation (Self- Compassion and Suppression) and higher levels of Hyper-arousal. T-tests revealed significant mean differences for the independent variables EMWS for the Raynaud's group (M = 66.66, SD = 25.59) and the No Raynaud's group, M =85.21, SD = 11.83; t (46) = 4.00, p = .000, the magnitude of the mean difference = .85, 95% CI: 9.22 to 27.90 (eta Squared = .27), Common Humanity for the Raynaud's group (M = 12.73, SD = 3.59) and the No Raynaud's group, M =15.00, SD = 3.74; t (66) = 2.10, p = .040 the magnitude of the mean difference = .85, 95% CI: -0.16 to -0.01 (eta Squared = .03). Results demonstrated

that individuals diagnosed with Raynaud's phenomenon reported experiencing lower levels of EMWS and Common Humanity when compared with those without a diagnosis of Raynaud's phenomenon.

Significant variables were placed into a multivariate analysis of variance to investigate differences in the Raynaud's and No Raynaud's groups and the independent variables EMWS and Common Humanity. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance, multicollinarity, Box's tests of equality of covariance matrices was significant at .035; Levene's test of equality of variance was significant at .001 for EMWS, therefore a more conservative alpha of .025 was set for the univariate F-test (as suggested by Tabachnick & Fidell, 2007). As unequal group sizes were evident in the study, N=52 for the Raynaud's group and N=15 for No Raynaud's group and as the percentage of Raynaud's phenomenon in the scleroderma population is generally 90-95%, the results may be indicative of this population; and as Tabachnick and Fidell (2007) suggest that Box's M can tend to be too strict, results were reported.

There was a statistically significant difference between individuals with and without Raynaud's on the combined dependant variables, Wilk's Lambda, F (2, 62) = 4.62, p = .014. When the results for the dependent variables were considered separately EMWS was the only variable to reached statistical significance, EMWS F(1, 63) = 6.36, p = .014, partial eta = .09. Inspection of mean scores indicated that individuals in the Raynaud's group reported lower levels of EMWS (M = 66.53, SD = 26.02) than the No Raynaud's group (M = 85.31, SD = 12.31), indicating that individuals diagnosed with Raynaud's reported lower levels of early experiences of warmth and safety, when compared with individuals diagnosed with scleroderma with Raynaud's phenomenon, partially supporting hypothesis 6(b).

Hypothesis 6(c, d, & e): Remaining Specific Symptoms & Psychosocial Variables

T-Tests were performed to address hypothesis 6(c & d): individuals with Intestinal and

Breathing problems will report lower levels of EMWS, Self- Compassion, Emotion Regulation and an Insecure Attachment Style and higher levels of Hyper-arousal, than individuals without Intestinal and Breathing problem. T-Tests revealed no significant mean difference between these groups. A Mann-Whitney U Test was performed due to skewed distribution to address hypothesis 5(e): individuals diagnosed with Finger Ulcers will report difference in levels of psychosocial variables when compared to individuals without this diagnosis. Results revealed no significant difference between groups. Therefore hypotheses 6*(c, d & e)* were not supported.

Hypothesis Seven: Skin Severity and Psychosocial Variables

T- Tests and a MANOVA were performed to determine the seventh hypothesis: individuals reporting higher levels of Skin (thickening) Severity resulting from Scleroderma will also report lower levels of EMWS, an Insecure Attachment Style; higher levels of Suppression and lower levels of Self-compassion. T-Tests revealed significant mean differences for the independent variables Suppression for the Mild skin group (M = 3.07, SD = .91) and the Moderate skin group, M =3.94, SD = .60; t (35) = -3.49, p = .001, the magnitude of the mean difference = .85, 95% CI: -1.38 to -.365 (eta Squared = .09).

Significant differences for EMWS for the Moderate skin group (M = 77.22, SD = 18.94) and the Severe skin group, M = 63.45, SD = 27.57; t (52) = 2.17, p = .034, the magnitude of the mean difference = .85, 95% CI: 1.06 to 26.48 (eta Squared = .04). Significant differences for Dismissive attachment for the Moderate skin group (M = 14.29, SD = 4.19) and the Severe skin group, M =17.32, SD = 3.78; t (53) = -2.81, p = .007, the magnitude of the mean difference = .85, 95% CI: -5.19 to -.871 (eta Squared = .05), and Dismissive attachment for the Mild skin group (M = 13.83, SD = 5.01) and the Severe skin group, M =17.32, SD = 3.78; t (53) = -2.19, p = .044, the magnitude of the mean difference = .85, 95% CI: -6.87 to -.106 (eta Squared = .05). Significant differences for Fearful attachment for the Mild group (M = .82, SD = .15) and the Severe skin group, M =1.00, SD = .16; t (41) = -3.49, p = .001, the magnitude of the mean

difference = .85, 95% CI: .290 to .078 (eta Squared = .08) and Suppression for the Mild group (*M* = 3.07, *SD* = .91) and Severe skin group, *M* =3.78, *SD* = .87; *t* (36) = -2.25, *p* = .030, magnitude of the mean difference = .85, 95% CI:.-1.31 to -.069 (eta Squared = .06).

Results revealed significant differences between the Mild and Moderate skin thickening groups and the independent variable Suppression, the Moderate and Severe skin thickening groups and the independent variables EMWS and Dismissive attachment, Fearful attachment and Suppression for the Mild and Severe skin thickening groups.

A one way between groups multivariate analysis of variance was performed to investigate differences in the independent variables Early Memories of Warmth and Safeness, and Dismissive Attachment style, Fearful Attachment and Suppression for the Mild, Moderate and Severe Skin thickening groups. There was a statistically significant difference between individuals diagnosed with varying levels of skin involvement and the combined dependant variables, Wilk's Lambda *F*(8,57) = 3.24, *p* = .002.

When the results for the dependent variables were considered separately all variables except early memories of warmth and safeness reached statistical significance, insecure Dismissive attachment *F*(2, 58) = 5.03, *p* = .010, partial eta = .15, insecure Fearful attachment *F*(2, 57) = 4.90, *p* = .011, partial eta = .15, emotional Suppression *F*(2, 57) = 4.61, *p* = .014, partial eta = .14, and EMWS, *F*(2, 57) = 2.42, *p* = .098, partial eta = .08.

Inspection of mean scores indicated individuals with Severe Skin involvement had less experience of early memories of warmth and safeness than the Moderate and Mild Skin thickening groups. Mean scores for insecure Dismissive Attachment also indicated that the Severe Skin group reported higher levels of this style of attachment than the Mild and Moderate Skin groups, and the Moderate group had higher levels of insecure Dismissive Attachment than the mild group. The Severe Skin group also had higher levels of insecure Fearful Attachment than the Mild and Moderate groups and the Moderate group had higher

levels of insecure Fearful Attachment than the Mild group. Results are presented below in Table 6.

Table 6

Summary of Results (MANOVA) for Scleroderma Skin Severity

Variables	N	M	SD
EMWS (not significant)			
Mild	12	70.83	23.83
Moderate	23	77.22	18.94
Severe	25	61.72	28.93
Dismissive Attachment Style			
Mild	12	13.83	5.00
Moderate	23	14.17	13.24
Severe	25	17.60	3.94
Fearful Attachment Style			
Mild	12	0.82	0.15
Moderate	23	0.92	0.16
Severe	25	0.99	0.17
Suppression			
Mild	12	3.07	0.91
Moderate	23	3.88	0.58
Severe	25	3.78	0.87

The Severe Skin group and the Moderate Skin group also reported higher Suppression than the Mild group. Therefore individuals with Severe and Moderate Skin involvement reported higher levels of the Suppression and a greater tendency to engage in the insecure attachment styles, Dismissive and Fearful attachment than the Mild less severe skin group. The Severe Skin group also reported higher levels of Dismissive and Fearful attachment than the Moderate and Mild Skin groups; partially supporting the seventh hypothesis.

Hypothesis 8-9: Mental Health; Hyper-arousal and Psychosocial and Scleroderma.

Hypothesis Eight: Depression, Anxiety, Stress and Biopsychosocial Variables

Bivariate correlations and regression analysis were used to investigate the eighth hypothesis: Depression, Anxiety and Stress will be associated with lower EMWS, and Self-compassion, insecure attachment and higher Suppression, Scleroderma disability, Pain and Specific symptoms. Furthermore predictor variables for Depression, Anxiety and Stress will differ between individuals with Diffuse and Limited sclerosis. In addition differences will occur between individuals reporting specific scleroderma symptoms when compared with individuals without these conditions in relation to Depression, Anxiety and Stress.

Hypothesis 8(a): Scleroderma - Depression and Biopsychosocial Variables

Frequencies (DASS21) were used to determine the percentage of individuals reporting Depression, Anxiety and Stress. Results revealed a total of 57.3% of individuals diagnosed with scleroderma experienced Depression, 36% experienced mild depression, 10.6% experienced moderate depression and 10.7% experienced severe levels of depression. Notably the remaining 42.7% all reported the highest score (9) within the normal range (0-9) for depression indicating that all participants in this sample experience depressive symptoms. Pearson's bivariate correlations were conducted after the assumptions for multiple regression were met; results revealed meaningful relationships between the dependent variable Depression and EMWS (r = -.39, p = .001), Dismissive attachment style (r = .29, p = .015),

Fearful attachment style (r = .36, p = .002), Self-compassion (r = .28, p = .027), Raynaud's phenomenon (r = .29, p = .012). Multiple regression analysis was conducted to determine the contribution of the predictor variables EMWS, Fearful attachment and Raynaud's (variables significant at .01 were selected due to large number of variable-participant ratio) with the dependent variable and are presented in table 6. Results demonstrated the variables significantly accounted for 48.8% (Adjusted R^2 = 20.4%) of the variance, F (3, 67) = 6.97, p = .000, (power was calculated at .99) in Depression. The regression coefficients presented in Table 7, demonstrated that EMWS (β = -.30, p = .009, sr^2 = 8.1%) and Fearful Attachment (β = .29, p = .012, sr^2 = 7.5%) were significant unique predictors of Depression.

Table 7

Summary of the Multiple Regression Analysis for Scleroderma Depression N = 75

Variable	*B*	*SEB*	*β*
Depression			
EMWS	.000	.000	-.30*
Fearful attachment	- .052	.021	-.29*
Raynaud's phenomenon	.016	.013	-.13
Total R2	.24***		

*p < .05 **p < .01 ***p < .001

Hypothesis 8(b): Scleroderma - Anxiety and Biopsychosocial Variables

Frequencies were utilised to determine the percentage of individuals reporting Anxiety. A total of 80.0% of Scleroderma individuals in this study experienced Anxiety with 22.7% experiencing mild Anxiety, 44.0% reporting moderate Anxiety and 13.3%

experiencing severe levels of Anxiety. Notably the remaining 20.0% reported the highest score within the normal range (0-7) for Anxiety, indicating that all participants in this sample experience some symptoms of Anxiety. Pearson's bivariate correlation coefficients revealed a number of significant variables for Anxiety. EMWS (r = .47, p = .000), Breathing (r = .42, p = .000) and Suppression (r = .33, p = .006), Self-judgment (r = .30, p = .013), Isolation (r = .30, p = .013), Intestinal (r = .25, p = .033), Pain (r = .28, p = .014), Disability (r = .26, p = .023), were entered into a multiple regression analysis. Results are presented in Table 8.

Table 8

Summary of the Multiple Regression Analysis for Anxiety & Biopsychosocial Variables N=65

Variable	*B*	*SEB*	*β*
Anxiety			
EMWS	- .003	.000	-.47***
Breathing	.019	.004	.42***
Suppression	.064	.014	.39***
Total R2	.52***		

*p < .05 **p < .01 ***p < .001

The results for the Scleroderma Sample demonstrated the variables significantly accounted for 72.1% (Adjusted R^2 = 49.6%) of the variance, $F(3, 62) = 22.35$, p = .000 in Anxiety (power .99). The regression coefficients demonstrated that EMWS (β = -.47, p = .000, sr^2 = 31.0%), Breathing (β = .42, p = .000, sr^2 = 26.4%), and Suppression, (β = .39, p .000, sr^2 = 23.8%), were significant unique predictors of Anxiety experienced by individuals with Scleroderma. Therefore results partially supported hypothesis 8(d).

Hypothesis 8(c): Scleroderma - Stress and Biopsychosocial Variables

A total of 22.7% of individuals diagnosed with scleroderma experienced stress; 14.7% experienced mild levels of stress, and 8.0% experienced moderate stress. Pearson's bivariate correlations revealed meaningful relationships between, Stress and EMWS (r = -.36, p = .002), Self-Compassion (r = -.38, p = .002), Age diagnosed with Raynaud's (r = -.37, p = .026), and Raynaud's (r = .25, p = .030); the lower correlation of the two Raynaud's variable's was excluded to prevent multicollinarity; the remaining variables and Age diagnosed with Raynaud's were entered into multiple regression analysis. Results demonstrated the variables EMWS, Self-compassion and Age diagnosed with Raynaud's, significantly accounted for 57.3% (Adjusted R^2 = 25.0%) of the variance, $F(3,26) = 4.23$, p = .004 (power was calculated at .89), in Stress. The regression coefficients presented in Table 9, demonstrated that Age diagnosed with Raynaud's (β = -.36, p = .042, sr^2 = 20.6%) significantly predicted Stress in individuals diagnosed with Scleroderma.

Table 9

Summary of the Multiple Regression Analysis for Stress entering Predictor Variables N= 29

Variable	*B*	*SEB*	*β*
Stress			
Age Diagnosed Raynaud's	-.004	-.002	-.36*
Self- Compassion	-.002	-.001	-.21
EMWS	- .002	.001	-.34
Total R2 .33*			

*p < .05 **p < .01 ***p < .001

Results indicated that the earlier an individual with Scleroderma is diagnosed with Raynaud's phenomenon, the greater their reported experience of Stress.

Hypothesis 8(d): Limited & Diffuse Sclerosis - Depression and Biopsychosocial Variables

Limited Sclerosis: A split file for Diffuse and Limited sclerosis was conducted to further address the sixth hypothesis; that individuals diagnosed with Diffuse and Limited sclerosis would report difference in Scleroderma symptoms, EMWS, insecure attachment and emotion regulation strategies associated with Depression. The assumptions for multiple regression analysis were met. Pearson's bivariate correlations for Limited sclerosis revealed meaningful relationships between the dependent variable Inverse Depression and EMWS, (r = -.50, p = .001), Dismissive attachment (r = -.37, p = .018), Suppression, (r = -.48, p = .002), Fearful attachment (r = -.33, p = .036), Self-judgment (r = -.35, p = .030) and Intestinal, (r = -.32, p = .036). Variables significant at .01 were entered into multiple regression analysis; coefficients revealed that both EMWS and Suppression were significant predictors of Depression for the Limited sclerosis group. The results for the Limited group demonstrated the variables significantly accounted for 65.58 (Adjusted R^2 = 40.0%) of the variance, F (2, 34) = 12.97, p = .000 (power .99), in Depression. The regression coefficients demonstrated that EMWS (β = -.45, p = .001, sr^2 = 25.5%) and Suppression (β = .43, p = .002, sr^2 = 26.1%) were significant unique predictors of (Inverse) Depression experienced by individuals diagnosed with Limited sclerosis.

Diffuse Sclerosis: Pearson's bivariate correlations for Diffuse sclerosis revealed meaningful relationships between the dependent variable (Inverse) Depression and Isolation, (r = -.37, p = .045), Raynaud's (r = -.51, p = .002), Fearful attachment (r = -.41, p =.021), and Over-identification (r = -.55, p = .002), variables significant at .01 (due to a small participant sample), were entered into a multiple regression analysis. Results for the Diffuse group demonstrated the variables significantly accounted for 65.4% (Adjusted R^2 = 38.6%) of the

variance, F (2, 27) = 10.11, p = .001 (power .98), in Depression. Regression coefficients demonstrated that Over-identification (β = -.43, p = .009, sr^2 = 16.5%) and Raynaud's (β = -.38, p = .021, sr^2 = 12.6%), significantly predicted Depression for Diffuse sclerosis.

Results partially supporting hypothesis 8(d) indicated differences between groups for variables that predicted depression; with EMWS and Suppression predicting Depression for the Limited group and Over-identification (low self-compassion) and Raynaud's phenomenon predicting Depression for the Diffuse sclerosis group.

Hypothesis *8(e): Limited & Diffuse Sclerosis - Anxiety and Biopsychosocial Variables*

Limited Sclerosis: Pearson's bivariate correlation coefficients for the Limited sclerosis group revealed meaningful relationships between the dependent variable Anxiety and EMWS, (r = -.51, p = .001), Suppression, (r = .45, p = .005), Pain (r = .31, p = .049), Scleroderma disability (r = .31, p = .044), Breathing, (r = .46, p = .002), and Age diagnosed with Raynaud's (r = .56, p = .013). Variables significant at .01 for the Limited sclerosis group were placed into a multiple regression analysis, results demonstrated the variables significantly accounted for 79.0% (Adjusted R^2 = 58.9%) of the variance, F(3,33) = 18.22, p = .000, (power .99) in Anxiety. Regression coefficients demonstrated that EMWS (β = -.54, p = .000, sr^2 = 28.4%) Breathing (β = .47, p = .000, sr^2 = 20.4%) and Suppression (β = .29, p = .013, sr^2 = 7.8%) were significant unique predictors of Anxiety for Limited sclerosis. Results indicated that EMWS, Suppression and Breathing problems predicted higher experiences of Anxiety in individuals diagnosed with Limited sclerosis.

Diffuse Sclerosis: Pearson's bivariate correlations revealed meaningful relationships between the dependent variable Anxiety and EMWS, (r = -.42, p = .018), Isolation (r = .38, p = .033), Reappraisal (r = .36, p = .044), Breathing (r = .36, p = .039), for the Diffuse sclerosis group. Due to small sample size the two most significant variables for the diffuse group were placed into a multiple regression analysis, results demonstrated the variables

significantly accounted for 59.4% (Adjusted R^2 = 30.3%) of the variance, $F(2,26) = 7.07$, $p = .004$, in Anxiety, power was calculated at .92. Regression coefficients demonstrated EMWS ($\beta = -.46$, $p = .008$, $sr^2 = 20.6\%$), Isolation ($\beta = .43$, $p = .012$, $sr^2 = 18.1\%$) were significant unique predictors of Anxiety in individuals with Diffuse sclerosis.

Results indicated similarities and differences between groups for variables that predict Anxiety; with EMWS, predicting Anxiety in both groups and differences occurring in predictor variables Suppression and Breathing problems for Anxiety in individuals diagnosed with Limited sclerosis and Isolation (low Self-compassion) predicting Anxiety in individuals diagnosed with Diffuse sclerosis, partially supporting hypothesis 8(e).

Hypothesis 8(f): Limited & Diffuse Sclerosis - Stress and Biopsychosocial Variables

Limited Sclerosis: A split file for Pearson's bivariate correlations revealed meaningful relationships for Limited sclerosis between the dependent variable Stress and EMWS, ($r = -.45$, $p = .003$), Common humanity ($r = -.41$, $p = .013$), Over-identification ($r = .35$, $p = .035$), variables significant at .01, were entered into a multiple regression analysis. Multiple regression analysis was conducted to determine the relationship and unique contribution of the predictor variables with the dependent variables. Results demonstrated the variables significantly accounted for 52.7% (Adjusted R^2 = 23.5%) of the variance, $F(2, 34) = 6.54$, $p = .004$ (power was calculated at .91), in Stress. Regression coefficients demonstrated that EMWS ($\beta = -.36$, $p = .027$, $sr^2 = 11.4\%$) was a significant predictor of Stress for Limited sclerosis. Results demonstrated that individuals diagnosed with Limited Sclerosis who have experienced lower levels of EMWS, were likely to experience greater levels of Stress.

Diffuse Sclerosis: Pearson's bivariate correlations also revealed meaningful relationships for Diffuse sclerosis group for the dependent variable Stress and Self-Compassion ($r = -.51$), $p = .010$, Over-identification ($r = .65$, $p = .000$), Isolation ($r = .50$, $p = .005$), Self-judgment ($r = .37$, $p = .039$), Raynaud's ($r = .45$, $p = .008$), Age diagnosed

with Scleroderma (r = -.40, p =.021), and Age diagnosed with Raynaud's phenomenon (r = -.59, p = .008). Variables significant at .01 for the Diffuse group were placed into multiple regression analysis; Raynaud's was selected due to a greater n over Age diagnosed with Raynaud's to prevent multicolinarity. Results demonstrated the variables significantly accounted for 70.2% (Adjusted R^2 = 43.6%) of the variance, F (3, 27) = 8.73, p = .000, (power was calculated at .99) in Stress. Regression coefficients demonstrated that Over-identification (β = .56, p = .007, sr^2 = 31.7%) was a significant predictor of Stress in Diffuse participants.

Results indicated that individuals with Diffuse sclerosis, who engaged in higher levels of Over-identification, were likely to have greater Stress, while those with Limited sclerosis reporting lower EMWS, were likely to experience greater levels of Stress, demonstrating differences between groups for predictors of Stress, for the Diffuse (lower Self-compassion) and limited (lower EMWS) groups; therefore hypothesis 8(f) was partially supported.

Hypotheses *8(g, h & i): Specific Symptoms (Raynaud's) – Depression, Anxiety and Stress*

Raynaud's: T-Tests and a MANOVA were utilized to determine hypotheses 8(g): higher levels of Depression, 8(h): Anxiety and 8(i): Stress will be reported by individuals diagnosed with Raynaud's phenomenon when compared to individuals without Raynaud's. T-tests revealed significant mean differences for the independent variables (transformed inverse) Depression for the Raynaud's group (M = .09, SD = .03) and the No Raynaud's group, M =.12, SD = .02; t (72) = 2.75, p = .008, the magnitude of the mean difference = .85, 95% CI: -.01 to .40 (eta Squared = .10), Stress for the Raynaud's group (M = 1.08, SD = .12) and the No Raynaud's group, M =.97, SD = .12; t (72) = -3.27, p = .002, the magnitude of the mean difference = .85, 95% CI: -0.18 to - 0.04 (eta Squared = .13), Anxiety for the Raynaud's group (M = 1.03, SD = .13) and the No Raynaud's group, M =.95, SD = .13; t (73) = -2.16, p = .034, the magnitude of the mean difference = .85, 95% CI: -0.16 to - 0.01 (eta Squared =

.06). Significant T-tests are presented in Table 10.

Table 10

T-Tests for Raynaud's/No Raynaud's for Variables Depression, Anxiety and Stress N=73

Variable	*M*	*SD*	*t*
Depression (inverse)			
Scleroderma/Raynaud's	.09	.03	
Scleroderma/No Raynaud's	.12	.02	
T-test			2.75**
Anxiety			
Scleroderma/Raynaud's	1.03	.13	
Scleroderma/No Raynaud's	.95	.13	
T-test			- 2.16*
Stress			
Scleroderma/Raynaud's	1.08	.12	
Scleroderma/No Raynaud's	.97	.12	
T-test			- 3.27**

*$p < .05$ **$p < .01$ ***$p < .001$

Preliminary assumption testing was conducted with no violations noted. There was a statistically significant difference between individuals with Scleroderma and Raynaud's and individuals with Scleroderma without Raynaud's phenomenon on the combined dependant variables, Wilk's Lambda, F (3, 69) = 4.37, p = .007. When the results for the dependent variables were considered separately all variables reached statistical significance, Depression, F (1, 71) = 7.39, p = .008, partial eta = .09. Stress F (1, 71) = 11.61, p = .001, partial eta = .14 and Anxiety, F (1, 63) = 7.62, p = .007, partial eta = .10. Inspection of mean scores indicated that individuals in the Raynaud's group reported higher levels of Depression, (transformed inverse) (M = .09, SD = .03) than the No Raynaud's group (M = .12, SD =.02), Stress, (M = 1.08, SD =.12) than the No Raynaud's group (M = .96, SD = .12) and Anxiety, (M = 1.03, SD =.13) than the No Raynaud's group (M = .93, SD = .10). Results indicated that differences occurred between groups with individuals diagnosed with Raynaud's experiencing higher levels of Depression, Anxiety and Stress than those individual's without a diagnosis of Raynaud's, partially supporting hypotheses 8(g, h & i). T-tests revealed no significant mean difference between any other specific symptom group and Depression, Anxiety and Stress.

Hypothesis 8(g): Specific Symptoms - Depression and Biopsychosocial Variables

Finger Ulcers: A Mann-Whitney U-Tests was performed due to skewed data to address hypothesis 8(j), higher levels of Depression, will be experienced by individuals diagnosed with specific scleroderma symptoms (Finger ulcers) when compared to individuals without this condition. Results for Finger ulcers revealed significant mean differences for Depression (transformed inverse) for the ulcer group (Md = .09, n = 45) and individuals without a diagnosis of Finger ulcers (Md = .13, n = 30), U = 451.50, z = -2.44, p = .015. The Finger ulcer group recorded a higher median score for Depression (inverse) than the No Finger ulcer group, indicating differences occurred between groups in that individuals with Finger ulcers have more severe depression than those without Finger ulcers, partially supporting hypothesis 8(j). No

other variable reached significance for Depression.

Scleroderma Specific Symptoms - Anxiety and Biopsychosocial Variables

Pain: T-test were utilized to determine the eighth hypothesis; higher levels of Anxiety will be reported by individuals who experience pain when compared to those individuals without pain. Results demonstrated a significant mean difference for Anxiety for the Pain group (M = 1.05, SD = .14) and the No Pain group, M =.98, SD = .12; t (73) = -2.40, p = .019, the magnitude of the mean difference = .85, 95% CI: -.13 to .01 (eta Squared = .06). Results indicated differences between groups as individuals with Scleroderma Pain experienced more severe Anxiety than individuals with Scleroderma without Pain, partially supporting hypothesis 8(h). No other significant relationships were identified for Pain.

8(i): Scleroderma Specific Symptoms - Stress and Biopsychosocial Variables

Intestinal: T-Tests for individuals diagnosed with an intestinal condition when compared to individuals without this condition, demonstrated a significant mean difference between the groups for the independent variable Stress for the Intestinal group (M = 1.08, SD = .12) and the No Intestinal group, M =1.01, SD = .13; t (73) = -2.15, p = .035, the magnitude of the mean difference = .85, 95% CI: -0.13 to - 0.001 (eta Squared = .06), indicating that individual's diagnosed with an Intestinal condition were likely to experience higher levels of Stress than those without this diagnosis. Results indicated differences between groups and therefore partially support hypothesis 8(i). No other variable reached significance for Stress.

Hypothesis Nine*:* Hyper-arousal and Biopsychosocial Variables

Pearson's bivariate correlations for Hyper-arousal revealed meaningful relationships between EMWS, (r = -.30, p = .017), Self-compassion (r = -.38, p = .003), Raynaud's (r = .26, p = .041), and Age diagnosed with scleroderma (r = -.37, p = .003). Variables significant at .01 were placed into a multiple regression analysis; results presented in Table 11, demonstrated the variables significantly accounted for 49.8% (Adjusted R^2 = 22.1%) of the variance, F(2,56) =

9.22, p =.000, (power was calculated at .98) in Hyper-arousal. The regression coefficients demonstrated that Self-compassion (β = -.34, p = .005, sr^2 = 10.1%) and Age diagnosed with scleroderma (β = -.32, p = .008, sr^2 = 11.3%) were significant unique predictors of Hyper-arousal in individuals diagnosed with Scleroderma.

Table 11

Summary of the Multiple Regression Analysis for Hyper-arousal entering predictor variables

Variable	*B*	*SEB*	*β*
Hyper-arousal			
Self-Compassion	- 5.34	1.84	- .34**
Age Diagnosed Scleroderma	-24.83	9.05	- .32**
Total R2	.25***		

*p < .05 **p < .01 ***p < .001

Results indicated that individuals with lower levels of Self-compassion and who were diagnosed with Scleroderma at a younger age, were more likely to experience greater levels of Hyper-arousal; partially supporting the ninth hypothesis. Pearson's bivariate correlation revealed the Hyper-arousal subscale Reactive hyper-arousal demonstrated a stronger relationship with a number of scleroderma symptoms and psychosocial variables than the total Hyper-arousal scale. Although not part of the original hypothesis this variable was also explored. Coefficients revealed meaning relationships between Reactive hyper-arousal and EMWS, (r = -.35, p = .003), Dismissive attachment style (r = -.41, p = .001), Fearful attachment style (r = .29, p = .045), Self-compassion (r = -.30, p = .018), Over-identification

(r = .41), p = .000, Isolation (r = .24, p = .044), Self-judgment (r = .35, p = .003), Raynaud's (r = .36, p = .003), Pain, (r = .28, p = .020) and Scleroderma disability (r = .27, p = .025). Due to small sample size and to prevent type 1 error the alpha level was increased to .01 and the three most significant variables at .01, were entered into multiple regression analysis. Results demonstrated the variables significantly accounted for 60.5% (Adjusted R^2 = 33.6%) of the variance, $F(3,64) = 12.30$, p = .000, (power was calculated at .99) in Reactive hyper-arousal. Regression coefficients demonstrated that Dismissive attachment (β = -.34, p = .001, sr^2 = 15.1%), Over-identification (β = -.33, p = .002, sr^2 = 10.8%) and Raynaud's phenomenon (β = .25, p = .017, sr^2 = 6.0%) significantly predicted Reactive hyper-arousal in individuals diagnosed with Scleroderma. Results indicated that individuals diagnosed with Scleroderma, who experienced more severe Raynaud's phenomenon symptoms, a Dismissive attachment style and engaged in higher levels of Over-identifying (low self-compassion) with experiences, reported greater levels of Reactive hyper-arousal. Results presented in Table 12.

Table 12

Multiple Regression Analysis for Reactive Hyper-arousal N = 67

Variable	*B*	*SEB*	*β*
Reactive Hyper-arousal			
Raynaud's Phenomenon	.04	.011	.25*
Dismissive Attachment	.22	.064	.34**
Over-identification	.27	.081	.33**
Total R2	.37***		

$p < .05$ **$p < .01$ ***$p < .001$

Results Supporting the Hypotheses

Results partially supported the overall research question: that biopsychosocial variables involving interpersonal and intrapersonal relationships and levels of hyper-arousal would influence the onset and severity of scleroderma symptoms. Table 13 provides a summary of the significant variables for scleroderma, specific types and symptom groups.

Table 13

Summary of Significant Variables: Scleroderma - Disease Types – Specific Symptoms

	Scleroderma		***Types of Scleroderma***		***Specific Scleroderma Symptoms***			
Study 1	***Scleroderma***	***Age Onset S R D L***	***Diffuse Sclerosis***	***Limited Sclerosis***	***Pain S D L P***	***Raynaud's S D L R***	***Disability S D L I B***	***Skin***
EMWS	X		X	X	X X ***X***	***X***		T
Fearful Attachment								***X***
Dismissive Attachment	X	X		X	X X ***X***			***X***
Low Self-Compassion	X					C		
Low Self-Kindness	X					X X	C	
Over-Identify	X	C C C	X					
Self-Judgement	X					C		
Isolation	X	C C						
Suppression	X	X			C		C	***X***
Hyperarousal	X	C C				C		
R-Hyperarousal			X			X X	C	
Depression	X					C ***X*** ***X***	C	
Anxiety	X	C			C T	C ***X***	C CC CX	
Stress	X	X C			C	C ***X***		

S = Scleroderma, D = Diffuse, L = Limited; Between Groups***: R** = Raynaud's/No Raynaud's **P** = Pain/No Pain, **I** = Intestinal/No Intestinal, **B** = Breathing/No Breathing*

X = Significant Predictor Variables, C = Significant Correlation Coefficients
X = Significant between Groups, T = Significant T-Tests

Table 13 is divided into Scleroderma, Diffuse and limited Sclerosis and Specific Symptoms. Psychosocial variables in the Scleroderma and Diffuse/Limited Sclerosis columns predict (X) these disease variables. Disease variables in the Specific Symptoms columns: X represents psychosocial predictor variables and ***X*** represents significant differences between groups with more negative experiences reported by those with specific disease symptoms when compared to those without these symptoms; for example ***P*** = pain/no pain groups - ***X*** represents significantly higher EMWS in the pain group when compared to the no Pain group.

Hypothesis One: Scleroderma Symptoms - Pain

Results partially supported the first hypothesis: that higher levels of Pain would be associated with elevated levels of Raynaud's phenomenon, Scleroderma disability, Intestinal problems and Breathing conditions in individuals diagnosed with Scleroderma. Pearson's bivariate correlation coefficients revealed meaningful relationships between the dependent variable Pain and the independent variables Raynaud's phenomenon, Intestinal and Breathing conditions and Scleroderma disability. Multiple regression coefficients demonstrated that Intestinal conditions and Scleroderma disability predicted Pain, in individuals diagnosed with Scleroderma.

Hypotheses Two: Scleroderma Symptoms - Early Life Experiences

Results partially supported the second hypothesis: 2(a): Lower levels of EMWS and an insecure attachment style (Dismissive and Fearful) would be associated (in individuals diagnosed with Scleroderma) with higher levels of Pain. 2(b): Raynaud's phenomenon, 2(c): Scleroderma disability, 2(d): Intestinal, 2(e): Breathing and 2(f): Finger ulcers.

Lower levels of EMWS, and a Dismissive attachment style (fearful attachment was not significant) were related to higher levels of Pain, in individuals diagnosed with

scleroderma, partially supporting hypothesis 2(a). Findings for hypotheses 2(b, c, d, e, & f) were not significant, therefore these findings did not support the second hypotheses.

Hypotheses Three: Scleroderma Symptoms - Emotion Regulation and Hyper-arousal

Results partially supported the third hypothesis 3(a): Lower levels of Self-compassion and higher levels of Suppression and Hyper-arousal would be associated (in individuals diagnosed with Scleroderma) with higher levels of Pain. 3(b): Raynaud's phenomenon, 3(c): Scleroderma disability, 3(d): Intestinal, 3(e): Breathing and 3(f): Finger ulcers.

The subscales of Hyper-arousal (Reactive hyper-arousal) and Self-compassion (Self-kindness) were significant unique predictors of Raynaud's experienced by individuals diagnosed with Scleroderma, partially supporting hypothesis 3(b). Reactive hyper-arousal was also significantly related to scleroderma disability, partially supporting hypothesis 3(c). Findings for hypotheses 3(a, d, e, & f) were not significant, and did not provide further support for the third hypotheses

Hypothesis Four: Age Diagnosed with Scleroderma/Raynaud's - Psychosocial Variables

Results provided partial support for hypothesis 4(a): Lower levels of EMWS and Self-compassion, an insecure attachment style (Dismissive and Fearful) and higher levels of Suppression and Hyper-arousal would be associated with an earlier diagnosis of Scleroderma and hypothesis 4(b): an earlier diagnosis of Raynaud's phenomenon. Pearson's bivariate correlation coefficients revealed meaningful relationships between Age diagnosed with Scleroderma and Hyper-arousal, Over-identification and Isolation; and Age diagnosed with Raynaud's phenomenon and Over-identification and Isolation. Multiple regression analysis revealed the models to be significant; however, no variable predicted Age diagnosed with Scleroderma or Raynaud's phenomenon. Therefore low Self-compassion (Over-identification and Isolation) was associated with an earlier diagnosis of Raynaud's and Scleroderma, with Hyper-arousal also significantly related to an earlier onset of Scleroderma, partially supporting

hypotheses 4(a & b).

Hypothesis Five: Diffuse and Limited – Difference in Biopsychosocial Variables

Results partially supported hypothesis 5(a): Individuals diagnosed with Diffuse and Limited sclerosis would report difference in psychosocial variables (EMWS, Dismissive and/or Fearful attachment, Suppression, Self-compassion subscales Mindfulness, Self-kindness, Common humanity, Self-judgment, Over-identification and Isolation, Hyper- arousal subscales, Introspect, Reactive) associated with Pain. 5(b): Raynaud's phenomenon, 5(c): Scleroderma disability, 5(d): Intestinal, 5(e): Breathing, 5(f): Finger ulcers, 5(g): Age diagnosed with Scleroderma and 5(h): Age diagnosed with Raynaud's phenomenon.

Pain: EMWS and a Dismissive attachment style and Age diagnosed with Scleroderma were significant unique predictors of Pain for the Limited sclerosis group, while Suppression was significantly related to Pain in the Diffuse group, demonstrating differences between groups for predictor variables for Pain, supporting hypothesis 5(a).

Raynaud's Phenomenon: Reactive hyper-arousal and low Self-kindness significantly predicted Raynaud's phenomenon for the Diffuse sclerosis group; whereas, higher levels of Self-judgment were significantly related to more severe experiences of Raynaud's in the Limited group, partially supporting hypothesis 5(b).

Scleroderma Disability: Pearson's bivariate correlations revealed that individuals diagnosed with Diffuse sclerosis reporting higher levels of disability resulting from scleroderma symptoms, experienced lower levels of Self-kindness; no significant relationship was found for the Limited sclerosis group, therefore differences occurred between groups on variables related to Scleroderma disability; results partially supported hypothesis 5(c).

Intestinal: Pearson's bivariate correlation coefficients revealed that Suppression was significant for the Diffuse sclerosis group for Intestinal problems; no significant association was found for the Limited sclerosis group, therefore a difference occurred between groups for

Intestinal conditions; partially supporting hypothesis 5(d).

Breathing: Different variables were significant for breathing problems; Suppression was significant for the Diffuse group and Common humanity was significant for the Limited group; partially supporting hypothesis 5(e).

Age Diagnosed with Scleroderma – Diffuse Sclerosis: Pearson's bivariate correlation coefficients for Diffuse sclerosis indicated a significant relationship between being diagnosed at a younger age with Scleroderma and experiencing elevated Hyper-arousal and low Self-compassion (subscale: over-identification).

Age Diagnosed with Scleroderma – Limited Sclerosis: An association between Hyper-arousal and an earlier diagnosis of Scleroderma was also found for Limited sclerosis, indicating similarities for the variables Hyper-arousal and a difference for the Self-compassion (subscale: over-identification) between the sclerosis groups; partially supporting hypothesis 5(g). Regression analysis revealed the model to be significant, however, the variables did not uniquely predict an earlier diagnosis of scleroderma for the Limited group.

Age Diagnosed with Raynaud's Phenomenon – Diffuse Sclerosis: Pearson's bivariate correlations revealed a significant relationship for the Diffuse group for Age diagnosed with Raynaud's phenomenon and low Self-compassion (over-identification).

Age Diagnosed with Raynaud's Phenomenon – Limited Sclerosis: Regression coefficients (multiple regression analysis) demonstrated that Dismissive attachment and Suppression were both significant unique predictors of Age diagnosed with Raynaud's phenomenon for the Limited sclerosis group. Results indicated differences between groups with low Self-compassion (over-identification) significantly related to Age diagnosed with Raynaud's for Diffuse and Dismissive attachment and Suppression predictors of age diagnosed with Raynaud's for Limited sclerosis, partially supporting hypothesis 5(h).

Hypothesis Six: Specific Scleroderma Symptoms – Difference in Psychosocial Variables

Results partially supported hypothesis 6(a): Lower levels of EMWS, emotion regulation (Self-compassion and Suppression) and insecure attachment (Fearful and Dismissive) would be reported by individuals experiencing Pain when compared with individuals without Pain. 6(b): Raynaud's phenomenon, 6(c): Intestinal, 6(d): Breathing and 6(e): Finger ulcers (experienced by individuals diagnosed with scleroderma) when compared with individuals diagnosed with Scleroderma without these conditions.

Pain: Differences between the Pain and no Pain groups were reported; with the Pain group reporting lower levels of EMWS and higher levels of Dismissive attachment than the no Pain group, partially supporting hypothesis 6(a).

Raynaud's: Individuals diagnosed with Raynaud's also reported lower levels of EMWS when compared with individuals without a diagnosis of Raynaud's phenomenon, partially supporting hypothesis 6(b). Results indicated that significant differences were apparent between those who experience different Scleroderma symptoms and their psychosocial experiences.

Hypothesis Seven: Scleroderma Skin Involvement – Psychosocial Variables

Results partially supported hypothesis seven: Lower levels of EMWS, Self-compassion, an insecure attachment style (Fearful and Dismissive) and higher levels of Suppression would be associated with greater Skin involvement associated with Scleroderma. Inspection of mean scores (not significant) indicated that individuals with Severe Skin involvement had less experience of EMWS than the Moderate and Mild Skin involvement groups. Mean scores for Dismissive attachment indicated that the Severe Skin involvement group reported higher levels of this style of attachment than the Mild and Moderate Skin groups, and the Moderate group had higher levels of Dismissive attachment than the Mild group. The Severe Skin group reported higher levels of Fearful attachment than the Mild and Moderate groups and the

Moderate group had higher levels of Fearful attachment than the Mild group; the Severe Skin group and the Moderate Skin group reported higher levels of Suppression than the Mild group.

Results revealed differences in EMWS and significant differences in attachment style and emotion regulation, for the Mild, Moderate and Severe Skin thickening groups. Results demonstrated that the more severe an individual's Skin involvement the more likely they will have lower early life experiences of warmth and safety, a significantly greater tendency toward a Dismissive and Fearful attachment style and higher levels of Suppression. Results partially support hypothesis seven.

Hypothesis Eight: Depression, Anxiety and Stress – Biopsychosocial Variables

Hypotheses 8(a): Scleroderma - Depression, 8(b): Anxiety and 8(c): Stress would be associated with lower levels of EMWS, Self-compassion, an insecure attachment style (Fearful and Dismissive), higher Suppression, Scleroderma disability, Specific symptoms and Age diagnosed with Scleroderma/Raynaud's phenomenon.

Scleroderma - Depression: Results partially supported hypothesis 8(a); EMWS and Fearful attachment were significant unique predictors of Depression experienced by individuals diagnosed with Scleroderma.

Scleroderma - Anxiety: Results partially supported hypothesis 8(b); Breathing, EMWS and Suppression significantly predicted Anxiety experienced by individuals diagnosed with Scleroderma.

Scleroderma - Stress: Results partially support hypothesis 8(c); Age diagnosed with Raynaud's phenomenon, significantly predicted Stress in individuals diagnosed with Scleroderma, indicating that the earlier an individual diagnosed with scleroderma is diagnosed with Raynaud's the greater their experiences of Stress.

Hypotheses 8(d): Diffuse and Limited Sclerosis – Differences will occur in predictor variables (EMWS, Self-compassion, an insecure attachment style, Suppression, Scleroderma

disability and Specific symptoms) for the Diffuse and Limited sclerosis groups for the dependant variables, Depression, 8(e): Anxiety and 8(f): Stress.

D*iffuse* and *Limited Sclerosis - Depression*: Results partially supported hypothesis 8(d); low Self-compassion (over-identification) and Raynaud's phenomenon predicted higher levels of Depression in Diffuse sclerosis; whereas EMWS and Fearful attachment predicted greater Depression in Limited sclerosis. Results demonstrated differences between predictor variables for Depression in the two illness groups (Diffuse and Limited sclerosis).

D*iffuse* and *Limited Sclerosis - Anxiety*: Results partially support hypothesis 8(e); lower EMWS and lower Self-compassion (greater feelings of isolation), predicted more severe Anxiety in Diffuse sclerosis; whereas more severe Breathing problems, low EMWS and greater Suppression predicted elevated levels of Anxiety in Limited sclerosis.

Results indicated that EMWS predicted Anxiety in both groups; however, difference occurred between groups for the remaining predictor variables: lower Self-compassion (Diffuse sclerosis), greater Suppression and Breathing problems (Limited sclerosis).

Diffuse and *Limited Sclerosis - Stress*: Results partially support hypothesis 8(f); Low Self-compassion (Over-identification) predicted Stress in Diffuse sclerosis, while EMWS predicted Stress in Limited sclerosis. Results demonstrated that differences occurred between groups for predictors of Stress.

Hypotheses 8(g): Higher levels of Depression, 8(h): Anxiety and 8(i): Stress would be reported by individuals with Scleroderma related Pain, Raynaud's phenomenon, Intestinal and Breathing conditions and Finger ulcers, when compared to individuals diagnosed with Scleroderma without these conditions.

Raynaud's Phenomenon - Depression, Anxiety and Stress: Results supported hypotheses 8(g, h & i). Results demonstrated that individuals diagnosed with Raynaud's reported higher levels of Depression, Anxiety and Stress when compared with those

individual's without a diagnosis of Raynaud's phenomenon. Indicating more severe psychological symptoms are likely to occur in individuals diagnosed with Scleroderma and Raynaud's when compared to those with a diagnosis of Scleroderma without Raynaud's phenomenon.

Finger Ulcers - Depression: Results for Finger ulcers also partially supported hypotheses 8(g); Individuals diagnosed with Finger ulcers reported higher levels of Depression than those individual's without this diagnosis. Therefore individuals diagnosed with Finger ulcers reported higher levels of Depression when compared with individuals without these experiences.

Breathing - Anxiety: Results also partially supported hypotheses 8(h): individual's diagnosed with Breathing conditions reported greater experiences of Anxiety when compared to those without this diagnosis; indicating differences between groups for Anxiety for those with and without Breathing problems.

Intestinal - Stress: Results partially supported hypotheses 8(i): Difference were reported for the Intestinal group and the no Intestinal group for Stress, indicating that individuals diagnosed with an Intestinal condition have higher levels of Stress than those without this diagnosis.

The results demonstrated that different psychological experiences occurred between Scleroderma participants who experienced different disease symptoms; with higher levels of Depression, Anxiety and Stress experienced by individuals diagnosed with Scleroderma and Raynaud's. Higher levels of Stress were also reported by individuals with Intestinal conditions; higher levels of Anxiety were experienced by those experiencing Breathing problems and higher levels of Depression were reported by individuals with Finger ulcers. Results indicated differences in psychological functioning between those individual's diagnosed with various Scleroderma symptoms when compared with individuals without those symptoms, partially

supporting the eighth hypothesis.

Hypothesis Nine: Hyper-arousal – Biopsychosocial Variables

Hypothesis nine: Higher levels of Hyper-arousal would be associated with lower levels of EMWS and Self-compassion, an insecure attachment style, greater levels of suppression and a diagnosis of scleroderma at a younger Age.

Hyper-arousal - Self-Compassion & Age Diagnosed with Scleroderma: Results indicated that the variables Self-compassion and Age diagnosed with scleroderma significantly predicted Hyper-arousal in individuals diagnosed with Scleroderma; demonstrating that individuals diagnosed with Scleroderma who have experienced lower levels of Self-compassion and were diagnosed with scleroderma at a younger Age, were more likely to experience greater levels of Hyper-arousal. Results therefore partially supported the ninth hypothesis.

Reactive Hyper-arousal: Although not part of the original hypotheses results demonstrated that Raynaud's, phenomenon, a Dismissive attachment style and low self-compassion (Over-identification) predicted Reactive hyper-arousal in individuals diagnosed with Scleroderma. Results indicated that individuals diagnosed with Scleroderma who experienced more severe Raynaud's symptoms, a Dismissive attachment style and a tendency to Over-identify with their situation, were likely to experience greater levels of Reactive hyper-arousal.

Summary of Significant Results

Pain

Hypotheses 1, 2(a), 5(a) & 6(a): Pearson's bivariate correlation coefficients and multiple regression analysis were conducted to determine the relationship between scleroderma symptoms and pain; psychosocial variables and pain, in individuals with scleroderma; and diffuse and limited sclerosis. T-test and MANOVA were also conducted to compare

differences in psychosocial variables between groups with pain and no pain symptoms.

Scleroderma Symptoms – Pain: Bivariate correlations revealed meaningful relationships between Raynaud's, phenomenon, intestinal conditions, breathing problems and scleroderma disability. Multiple regression analysis revealed that intestinal conditions and scleroderma disability were significant predictors of Pain. Results partially supported hypothesis one and demonstrated that individuals reporting greater scleroderma disability and intestinal problems were likely to experience more severe pain.

Scleroderma, Psychosocial – Pain: Results from multiple regression analysis for psychosocial variables demonstrated that individuals diagnosed with scleroderma who experienced low warmth and safety as a child and engaged in a dismissive style of relating reported more severe pain; partially supporting hypothesis 2(a).

Diffuse & Limited, Psychosocial - Pain: When the data was separated into the diffuse and limited sclerosis groups, low EMWS, a dismissive attachment style and a later diagnosis of scleroderma significantly predicted pain for the limited sclerosis group. However, suppression (and not EMWS, dismissive attachment or age diagnosed with scleroderma) was significantly related to pain in the diffuse group, indicating that different variables were related to pain in the two major subsets of scleroderma, supporting hypothesis 5(a).

Pain/No Pain – Psychosocial: A difference was also reported for individuals experiencing pain resulting from scleroderma symptoms and those diagnosed with scleroderma without associated pain; with the pain group reporting lower EMWS and higher levels of dismissive attachment than the no pain group, supporting hypothesis 6(a).

The hypotheses for pain were partially supported, with results generally indicating significant relationships between negative early life experiences, a dismissive attachment style, emotional suppression and scleroderma related pain/elevated pain.

Raynaud's Phenomenon

Hypotheses 3(b), 5(b) & 6(b): Pearson's bivariate correlations and multiple regression analysis were conducted to determine the relationship between Raynaud's phenomenon and psychosocial variables in individuals diagnosed with scleroderma; and diffuse and limited sclerosis. T-test and MANOVA were also conducted to compare differences between groups on psychosocial variables for Raynaud's and no Raynaud's symptoms.

Total Scleroderma Group: Reactive hyper-arousal and low self-kindness significantly predicted Raynaud's (multiple regression analysis) in individuals diagnosed with scleroderma; supporting hypothesis 3(b).

Diffuse & Limited: Reactive hyper-arousal and low self-kindness were significant unique predictors of Raynaud's for the diffuse sclerosis group; however, greater self-judgment (and not hyper-arousal and self-kindness) was the only significant correlation coefficient for Raynaud's in the limited group. Therefore different variables were related to and predicted Raynaud's phenomenon in the two major subsets of scleroderma; supporting hypothesis 5(b).

Raynaud's/No Raynaud's: A difference was also reported in individuals with Raynaud's when compared to those without a diagnosis of Raynaud's. EMWS predicted Raynaud's phenomenon when compared to those without this condition (MANOVA); partially supporting hypothesis 6(b). The hypotheses for Raynaud's phenomenon were partially supported, with results generally indicating differences between groups with significant relationships found between psychosocial variables, low self-compassion (low self-kindness and high self-judgment), elevated reactive hyper-arousal, negative early life experiences and Raynaud's symptoms.

Scleroderma Disability, Intestinal, Breathing and Finger Ulcers

Hypotheses 3(c), 5(c) & 6(c): Pearson's bivariate correlations and multiple regression analysis were conducted to determine the relationship between scleroderma specific symptoms

(disability, intestinal, breathing and finger ulcers) and psychosocial variables in individuals with scleroderma and diffuse and limited sclerosis. T-test and MANOVA were also conducted to compare differences between groups for psychosocial and specific scleroderma variables.

Scleroderma Disability: Results demonstrated that individuals reporting greater scleroderma disability experienced significantly higher reactive hyper-arousal; partially supporting hypothesis 3(c).

Diffuse/Limited: Results demonstrated that individuals with diffuse sclerosis who reported greater scleroderma disability experienced significantly lower levels of self-kindness, providing partial support for hypothesis 5(c); no variable was significant for the limited group.

Intestinal-Diffuse/Limited: Difference was found between groups; greater suppression was significantly related to more severe intestinal problems in the diffuse sclerosis group; however, no variable was significant for the limited group providing partial support for hypothesis 5(d).

There was no difference between the intestinal group and the no intestinal group therefore hypothesis 6(d) was not supported. No meaningful relationships were found between intestinal and psychosocial variables; therefore hypothesis 3(d) was not supported.

Breathing-Diffuse/Limited: Different variables were significant for groups for breathing; suppression was significant for the diffuse group and common humanity was significant for the limited group, partially supporting hypothesis 5(e).

No meaningful relationships were found between breathing and psychosocial variables, therefore hypothesis 3(e) was not supported. No difference was found between those with breathing conditions and those without this diagnosis, therefore hypothesis 6(e) was not supported.

Finger ulcers: Non-parametric analysis revealed no difference between individuals diagnosed with finger ulcers and those without a diagnosis of finger ulcers therefore hypothesis

6(f) was not supported.

The hypotheses for specific scleroderma symptoms was partially supported. Results demonstrated that elevated reactive hyper-arousal was significantly related to greater scleroderma disability. Some results indicated significant differences between the diffuse and limited groups for specific symptoms. Low self-compassion (subscale: low self-kindness) was significantly related to scleroderma disability; whereas greater suppression was significantly related to more severe intestinal and breathing experiences for individuals diagnosed with diffuse sclerosis. These variables were not significant for limited sclerosis.

Skin Severity

Hypothesis Seven

Results (t-tests) revealed significant differences between the mild, moderate and severe skin thickening groups and early memories of warmth and safeness, dismissive attachment style, fearful attachment and suppression, partially supporting the hypothesis. Multivariate analysis demonstrated that a greater tendency toward a dismissive and fearful attachment style and higher levels of suppression predicted more severe skin involvement (than those with mild and moderate skin thickening); partially supporting hypothesis seven. Mean differences although not significant also indicated that individuals with more severe skin thickening symptoms also experienced lower levels of EMWS when compared with individuals reporting mild and moderate skin involvement. .

Age diagnosed with Scleroderma and Raynaud's Phenomenon

Hypotheses 4(a) & 5(g) - Scleroderma: Results demonstrated that hyper-arousal, and low self-compassion (over-identification and isolation) were significantly related to age diagnosed with scleroderma. However, the variables did not predict age diagnosed with scleroderma, therefore hypothesis 4(a) was partially supported.

Diffuse/Limited: Correlation coefficients revealed similarities and differences for age

diagnosed with scleroderma for the diffuse/limited groups. Hyper-arousal was significant for both groups, with over-identification also significant for the diffuse sclerosis group. Regression coefficients for the diffuse sclerosis group did not reach significance, indicating partial support for hypothesis 5(g). Therefore the greater the levels of hyper-arousal the younger an individual would be diagnosed with diffuse/limited sclerosis, and for diffuse sclerosis, lower self- compassion (over-identification) was also associated with being diagnosed at a younger age with scleroderma.

Hypotheses 4(b) & 5(h) - Raynaud's: Correlation coefficients revealed meaningful relationships between age diagnosed with Raynaud's phenomenon and low self-compassion (subscales: over-identification and isolation), partially supporting hypothesis 4(b). Regression coefficients however, demonstrated that no variable predicted age diagnosed with Raynaud's.

Diffuse/Limited: Correlation coefficients demonstrated a significant relationship between age diagnosed with Raynaud's phenomenon and low self-compassion (over-identification) for the diffuse group; indicating that the younger the diagnosis with Raynaud's the greater the over-identification with one's experiences. Regression coefficients demonstrated that dismissive attachment and suppression were both significant predictors of age diagnosed with Raynaud's for limited sclerosis; indicating that the more an individual engages in suppression of emotions and a dismissive style of relating, the earlier the diagnosis with Raynaud's. Results demonstrated differences between groups and partially supported hypothesis 5(h).

Depression

Hypotheses 8(a, d & g) - Scleroderma: Results revealed that 57% of individuals diagnosed with scleroderma experienced depression, 36% experienced mild depression, 11% experienced moderate depression and 11% experienced severe levels of depression. The remaining participants reported symptoms of depression within the normal range, although all

of these scores were at the highest end of this range, indicating that all participants in this sample experience depressive symptoms. Multiple regression coefficients demonstrated that EMWS and fearful attachment were significant unique predictors of depression experienced by individuals diagnosed with scleroderma, partially supporting hypothesis 8(a).

Diffuse/Limited: Differences between limited and diffuse sclerosis were also found to support hypothesis 8(d). The regression coefficients for diffuse sclerosis demonstrated that low self-compassion (subscale: over-identification) and Raynaud's phenomenon were significant unique predictors of depression. The regression coefficients for limited sclerosis demonstrated that both EMWS and fearful attachment significantly predicted depression.

Overall results demonstrated that individuals diagnosed with scleroderma particularly those with limited sclerosis who have lower experiences of early memories of warmth and safety and a fearful style of relating, experienced higher levels of depression. Results also demonstrated that individuals diagnosed with diffuse sclerosis, who experienced more severe Raynaud's symptoms and (less self-compassion) a tendency to over-identify with their situation, experienced higher levels of depression.

Finger Ulcers/No Finger Ulcers: Individuals with finger ulcers also reported higher levels of depression than individuals without this condition supporting hypothesis 8(g).

Anxiety

Hypotheses 8(b, e & h) - Scleroderma: Eighty percent of individuals experienced anxiety; with 23% experiencing mild anxiety, 44% reporting moderate anxiety and 13% experiencing severe levels of anxiety. The remaining 20% reported the highest score for the normal range for anxiety indicating that all participants in this sample experience some anxiety symptoms. Results supporting hypothesis 8(b) demonstrated that elevated breathing problems, low EMWS and greater emotional suppression were significant unique predictors of anxiety experienced by individuals diagnosed with scleroderma.

Diffuse/Limited: These variables also predicted higher levels of anxiety in individuals diagnosed with limited sclerosis. While EMWS and low self-compassion (subscale: isolation) predicted more severe anxiety in individuals diagnosed with diffuse sclerosis; demonstrating that different variables predicted anxiety for the diffuse and limited sclerosis group (although EMWS was significant in both groups), partially supporting hypothesis 8(e). Results indicated that individual's diagnosed with scleroderma, with fewer experiences of EMWS, greater breathing problems and use suppression as an emotion regulation strategy were more likely to experience greater levels of anxiety, particularly those diagnosed with limited sclerosis. EMWS appears to be a variable that is constant for both groups in predicting anxiety, while different variables for diffuse (greater experiences of isolation) and limited (greater suppression and breathing problems) also predicted anxiety in the respective groups.

Pain/No Pain: Results also demonstrated that individuals reporting pain resulting from scleroderma symptoms, experienced higher levels of anxiety than those individuals diagnosed with scleroderma without associated pain. These results provide partial support for hypothesis 8(h).

Stress

Hypotheses 8(c, f & i) - Scleroderma: Twenty three percent of individuals diagnosed with scleroderma experienced stress, 15% experienced mild levels of stress and 8% experienced moderate levels of stress, with the remaining participants reporting low levels of stress. Results demonstrated that age diagnosed with Raynaud's phenomenon significantly predicted stress in individuals diagnosed with scleroderma; indicating that the earlier an individual (diagnosed with scleroderma) is diagnosed with Raynaud's phenomenon the greater their experiences of stress; partially supporting hypothesis 8(c).

Diffuse/Limited: Results revealed different predictor variables for each of the major subsets of scleroderma, partially supporting hypothesis 8(f). Low self-compassion (subscale:

over-identification) predicted stress in individuals diagnosed with diffuse sclerosis, while EMWS significantly predicted stress in individuals diagnosed with limited sclerosis.

Intestinal/No Intestinal: A difference was also reported for those reporting intestinal problems when compared to those without intestinal problems. Results indicated that individuals diagnosed with an intestinal condition experienced higher levels of stress than those without this diagnosis, partially supporting hypothesis 8(i).

Raynaud's/No Raynaud's: Results also revealed that individuals diagnosed with Raynaud's also reported higher levels of stress than those individual's without a diagnosis of Raynaud's phenomenon, partially supporting hypothesis 8(i).

Overall results revealed different predictor variables for each of the major subsets of scleroderma, EMWS for limited sclerosis and low self-compassion (over-identification) for diffuse sclerosis; while for the total sample an earlier diagnosis of Raynaud's phenomenon indicated greater levels of stress. Individuals reporting intestinal problems and Raynaud's phenomenon also reported elevated stress when compared to individuals without these conditions.

Hyper-arousal

Hypothesis Nine: Correlation coefficients revealed meaningful relationships between EMWS, self-compassion, Raynaud's phenomenon and age diagnosed with scleroderma. Regression coefficients indicated that individuals diagnosed with scleroderma who experienced lower levels of self-compassion and were diagnosed with scleroderma at a younger age, were more likely to experience greater levels of hyper-arousal, partially supporting the ninth hypothesis. Correlation coefficients also revealed that reactive hyper-arousal (subscale of hyper-arousal) demonstrated a stronger relationship with a number of scleroderma symptoms (Raynaud's phenomenon, pain and scleroderma disability) and psychosocial variables (EMWS, dismissive attachment, fearful attachment, self-compassion, over-identification, isolation and self-

judgment), than the total hyper-arousal scale and was therefore further investigated. Results indicated that individuals diagnosed with scleroderma who experienced more severe Raynaud's symptoms, a dismissive attachment style and tended to over-identify (low self-compassion) with their experiences were likely to report greater levels of reactive hyper-arousal.

Discussion

Results indicated that a number of relational factors and elevated arousal were linked to mental health and scleroderma symptoms and onset. Similarities and differences were also found between scleroderma groups for variables related to psychophysiological symptoms.

Pain: Results demonstrated that individuals diagnosed with scleroderma who experienced low warmth and safety as a child and engaged in a dismissive style of relating reported more severe pain, these results were also significant for individuals reporting pain when compared and those without pain. Low EMWS, a dismissive attachment style and a later diagnosis of scleroderma significantly predicted pain for the limited sclerosis group; whereas, suppression was significantly related to pain in the diffuse group, indicating differences between groups for variables that related to pain. The hypotheses for pain were partially supported, with results generally indicating significant relationships between negative early rearing experiences, a dismissive attachment style, emotional suppression and scleroderma related pain/elevated pain.

Specific Scleroderma Symptoms- Raynaud's: Reactive hyper-arousal and low self-kindness significantly predicted Raynaud's in the scleroderma group and also for the diffuse sclerosis group; whereas greater self-judgment was significantly related to Raynaud's for the limited group. Difference between groups were also reported by those with Raynaud's (EMWS) when compared to those without Raynaud's (no variable significant). *Scleroderma Disability:* Higher reactive hyper-arousal was related to greater scleroderma disability in the total group, whereas low self-kindness was significantly related to greater scleroderma

disability for diffuse sclerosis; no variable was significant for the limited group.

Intestinal & Breathing: Greater suppression was significantly related to more severe intestinal problems in the diffuse sclerosis group; whereas, no variable was significant for the limited group. Greater suppression was also significantly related to greater intestinal problems for the diffuse group and common humanity was significant for the limited group. *Skin Involvement:* A greater tendency toward a dismissive and fearful attachment style and higher levels of suppression predicted more severe skin involvement (than those with mild and moderate skin thickening).

Age Diagnosed Scleroderma/Raynaud's: Hyper-arousal, and low self-compassion (over-identification and isolation) were significantly related to age diagnosed with scleroderma in the total sample. Hyper-arousal was also significant for both the diffuse and limited groups, as well as over-identification (low self-compassion) for the diffuse group. Therefore greater hyper-arousal was significantly related to being diagnosed with diffuse/limited sclerosis, at a younger age, and for diffuse sclerosis, lower self-compassion (over-identification) was also significantly related. Low self-compassion (subscales: over-identification and isolation) was significantly related to a diagnosis of Raynaud's at a younger age for scleroderma. Low self-compassion (over-identification) was also significantly related to a diagnosis of Raynaud's at a younger age for the diffuse group; whereas dismissive attachment and suppression were significant predictors of being diagnosed with Raynaud's at a younger age for limited sclerosis.

Mental Health-Depression: Lower experiences of early memories of warmth and safety and a fearful style of relating, predicted greater depression in the scleroderma group and the limited sclerosis group. More severe Raynaud's symptoms and less self-compassion (over-identification) predicted higher levels of depression in the diffuse sclerosis group. Individuals with finger ulcers also reported significantly higher levels of depression than individuals without this condition.

Anxiety: Fewer experiences of EMWS, greater breathing problems and suppression predicted elevated anxiety in the scleroderma and limited groups. EMWS and low self-compassion (greater isolation) predicted anxiety in the diffuse group. Individuals reporting scleroderma pain experienced significantly higher levels of anxiety than those without pain.

Stress: Low EMWS predicted stress in the limited sclerosis group, whereas low self-compassion (over-identification) predicted stress for the diffuse sclerosis group. An earlier diagnosis of Raynaud's phenomenon was significantly related to greater levels of stress for the total sample. Individuals with intestinal problems and Raynaud's phenomenon reported significantly greater levels of stress when compared to individuals without these conditions.

Hyper-arousal: Lower self-compassion and diagnosed with scleroderma at a younger age, predicted greater hyper-arousal. Whereas more severe Raynaud's symptoms, a dismissive attachment style and low self-compassion (over-identification) predicted greater reactive hyper-arousal.

The results suggest that individuals diagnosed with scleroderma generally experience a combination of symptoms that differ between the major subsets of scleroderma and specific symptom groups; although, some similarities were evident. Greater hyper-arousal was significantly related to being diagnosed at a younger age for both diffuse and limited sclerosis and fewer experiences of EMWS predicted anxiety for both the diffuse and limited groups. A range of different psychosocial variables in the current study were found to predict different scleroderma symptoms for the total sample and for the major subsets, diffuse and limited sclerosis; findings that provided partial support for the hypotheses.

Differences were found between individuals with specific scleroderma symptoms when compared to individuals with scleroderma without specific symptoms (e.g., Pain, No Pain; Raynaud's, No Raynaud's) and psychosocial variables. Differences may occur due to a number of reasons, such as exposure to early life stress, individual differences in how a

person may relate to themselves and others in times of stress; and the different effects that stress may have on an individual's immune functioning and levels of pain, or a combination of these experiences. Scleroderma participants exposed to stressful situations may also experience different responses to stress. Stressors generally evoke different physical and emotional responses depending on an individual's experiences and resources, such as previous exposure to stress and trauma, coping styles, age, gender and/or genetic predispositions (e.g., Every & Lating, 2002; Lazurus & Folkman, 1984).

Different responses to stress may therefore explain the different predictor variables associated with a range of different scleroderma symptoms. Stressors, such as emotional, immunological and inflammatory responses may elicit excessive arousal reactions dependant on the intensity of the individual's response (Selye, 1976), as a result of the internal (e.g., adequacy of emotion regulation strategies) and external resources (e.g., capacity to engage others in times of need) that are available to the individual (Lazurus & Folkman 1984).

These factors may account for differences in the predictor variables, early memories of warmth and safety, dismissive and fearful attachment styles, hyper-arousal, stress, the emotion regulation strategy suppression, self-compassion and mental health disorders of depression and anxiety for the total scleroderma sample; and the diffuse and limited subsets of scleroderma; in relation to multiple aspects of this complex disease such as Raynaud's phenomenon, intestinal conditions, breathing problems, disability and pain.

Early Life Stress, Attachment and Suppression Predict Elevated Pain

Scleroderma: Severity of scleroderma pain was predicted in the total scleroderma sample by early stress experiences, specifically recall of few experiences associated with warmth and safety and insecure (dismissive) attachment (and a later diagnosis of scleroderma in the limited sample). These variables with the exception of a later diagnosis of scleroderma were also significant for scleroderma participants experiencing pain, when compared to

scleroderma participants without pain. These findings supported the hypothesis and are consistent with the biopsychosocial perspective of pain that includes physical, emotional, cognitive, anticipatory and previous experiences, psychological factors and aspects that involve sensations, attention and interpretation (Lee-Chiong et al., 2010). The biopsychosocial model emphases that pain is a multifaceted experience explained by biological factors such as tissue damage while acknowledging the influence of social and psychological aspects (Keefe et al., 2006); the results in the current study provide further support for this model.

The implication is that early stress experiences are likely to compromise an individual's ability to manage the emotional and cognitive aspects associated with pain, resulting in elevated experiences of pain. Pain is recognized as a subjective experience that differs between individuals (Lee-Chiong et al., 2010) and in the current study was due to a number of factors including personal experiences. The intensity of the pain experienced in the current study was linked to early childhood experiences associated with feelings of insecurity and limited resources to manage emotions in relationships, which may reflect negative early relational experiences. Early experiences associated with affective states of safety and nurturing are important factors in relation to emotion regulation strategies and coping (Gilbert and colleagues, 2008). Early experiences of threat and affective states associated with feeling unsafe or uncared for appear to promote the development of neural networks in the threat system and a diminished ability to generate self-soothing behaviours.

Findings in the current study are consistent with research by Gilbert (2008), Sachs-Ericsson et al. (2005), and Thakkar and McCanne (1999), which suggests early life stress involving a lack of warmth and safety (including experiences of child abuse) is linked to elevated levels of stress in adulthood and to physical illness (scleroderma, in the current study) and pain (scleroderma related pain). These negative childhood experiences are also

associated with an insecure attachment style (e.g., Gilbert, 2008) and emotion regulation strategies that involve avoidance, such as suppression (Gross, 1998; Hayes et al., 1996; Iwamitsu, et al., 2005), also found in the current study to be associated with scleroderma.

Recall of affect in relation to childhood memories explain feelings of threat not accounted for by the recall of any particular stressful event (Richter et al., 2009). Individual perceptions of experiences and the development of adequate resources to manage adversity may impact on the experience of pain for individuals with scleroderma. As exposure to early life stress can influence the developing brain and the individuals' capacity to regulate emotions and reduce arousal levels in stressful situations throughout life, affecting pain thresholds and impacting on the regulation of the immune system (Depue et al., 2005; Heit et al., 1999; Schore, 1994); findings in the current study suggest that individuals with scleroderma reporting negative early life experiences, may suffer elevated levels of pain resulting from the emotional contribution involved in a dismissive style of relating to attachment figures.

Engaging in a dismissive way of relating to significant others reduces the opportunity for the individual diagnosed with scleroderma to engage others as external emotion regulators in times of stress/distress to reduce arousal levels. This way of relating limits the individual's calming resources to that of self-reliance and the capacity to self-sooth. The ability to self-sooth and reduce arousal may be inadequate, due to limited early learning experiences that provide feelings of warmth and safety and enable the development of effective emotion regulation strategies that decrease arousal. Adverse early life experiences and the inability to rely on others to reduce arousal in the current study, are experiences that contributed to elevated pain in individuals diagnosed with scleroderma.

Individuals who have an under-developed ability to self-sooth may respond defensively and have difficulty feeling safe or content; which may explain the findings by

Angelopoulos et al. (2001), and Hyphantis et al. (2007), that suggested individuals with scleroderma tend to be defensive. The current findings provide a possible explanation as to the process involved in the development of defensiveness in individuals diagnosed with scleroderma. The findings in the current study suggest that low early life experience of warmth and safety and a dismissive style of relating may result in individuals diagnosed with scleroderma expressing behavioural responses that appear defensive. Early life experiences that do not provide opportunities to experience nurturing and safety may increase the development of the threat system and reduce the capacity to self-sooth and therefore the ability to reduce arousal.

Early life and adult attachment experiences involving the threat system (a reduced capacity to effectively down regulate emotions and the subsequent physiological response), significantly predicted elevated pain in individuals diagnosed with scleroderma; when engaged in higher levels of threat related (attachment) protective strategies. Pain is a common experience associated with scleroderma and in the current study is associated with a number of scleroderma symptoms including gastrointestinal, Raynaud's phenomenon, scleroderma disability and breathing problems; with intestinal and disability resulting from scleroderma symptoms significant predictors of pain. The current findings are consistent with previous biological findings related to pain and disability in scleroderma research by Miller and colleagues (2012).

As pain involves emotional and sensory experiences associated with tissue damage (Lee-Chiong et al., 2010), the findings in the current scleroderma study (not previously studied) suggest that the level of pain intensity experienced in the current scleroderma findings is related to more negative early relational and adult relational experiences. Individual differences in attachment styles may be a determining factor in relation to the coping strategies utilized to manage internal and external stress and the level of pain experienced by individuals

diagnosed with scleroderma. Individuals with scleroderma who have developed a dismissive style of relating may lack the capacity to trust others; and as a result exhibit independent defensive behaviours, due to underlying insecurity around gaining assistance from others that results in avoidance and distancing. This way of relating may result in individuals diagnosed with scleroderma becoming over-stimulated, creating hyper-arousal in relatively minor situations and increasing experiences of pain.

The intensity of the pain experienced by the person diagnosed with scleroderma may also be compounded when attempting to manage adverse situations due to limited abilities to use flexible coping strategies that facilitate the reorganisation of thoughts (attachment characteristics identified by Simpson & Rholes, 1998). The incapacity to adapt to situations due to an inflexible thinking style may also explain the increase in pain experienced by individuals diagnosed with scleroderma; as the function of pain involves a number of processes including cognitive appraisal.

Physiologically elevated or excessive experiences of pain in individuals diagnosed with scleroderma may also result from nociceptors that are sensitive to tissue damage and that react to changes such as inflammation, a condition experienced by people with scleroderma (Lee-Chiong et al., 2010; Smith & Kahaleh, 2008; Sumpio, Riley, & Dardik, 2002). The effect of this condition may create an over sensitivity to pain, due to over stimulation or irritation resulting in a lowering of the nociceptors firing thresholds, increasing the responsiveness to painful stimuli; and in some cases individuals may become hypersensitive to non-dangerous/harmless stimuli (Lee-Chiong et al., 2010). These experiences activate reflexes in a number of structures including the spinal cord, brainstem, cortex and limbic (or emotional) system and tend to distort the relationship between the degree of tissue damage and the extent to which pain intensity is perceived by the individual (Lee-Chiong et al., 2010).

Therefore emotional stimuli perceived as threatening in relational experiences by individuals diagnosed with scleroderma may also be explained by physiological responses that create an overstimulation of the nociceptors firing thresholds, increasing scleroderma individual's experience of pain.

Scleroderma – Pain: The results in the current study (that limited early life experiences of warmth and safety and a greater tendency to engage in a dismissive attachment style predicted elevated levels of pain) are consistent with previous research that has explored emotions in relation to how people experience pain in other illness populations (e.g., Davies et al., 2009; Dragkioti et al., 2011; Jones et al., 2009; McWilliams et al., 2000). Research suggests that increased pain is associated with a number of psychosocial problems including regulating and expressing emotions, an insecure attachment style and childhood experiences of stress; this research is consistent with the current findings not previously studied in the total scleroderma sample.

Diffuse & Limited Sclerosis- Pain: When the sample in the present study was divided into the two major subsets of scleroderma (limited sclerosis and diffuse sclerosis), results provided partial support for the hypothesis and demonstrated differences in predictor variables. Early memories of warmth and safety, dismissive attachment and age diagnosed with scleroderma were significant predictors of pain in the limited sclerosis sample, indicating that individuals with limited sclerosis reporting lower levels of EMWS, a greater tendency to engage in a dismissive style of relating and a diagnosis of scleroderma at an older age, were more likely to experience elevated levels of pain; while the emotion regulation strategy suppression was significant for the diffuse sclerosis sample; demonstrating that diffuse sclerosis participants reporting higher suppression strategies, experienced elevated pain. Differences in the variables between the two groups demonstrated that negative social relational experiences (interpersonal and intrapersonal) involving attachment and early

experiences of nurturing are implicated in the levels of pain experienced by those diagnosed with limited sclerosis. Individuals with an insecure attachment style may interpret their relational experiences as threatening and may physiologically respond to this perception, producing elevated levels of arousal that may increase the experience of pain; due to a limited capacity to self-sooth. These experiences may have resulted from very few experiences of warmth and safety as a child and therefore ineffective emotion regulation strategies to self-sooth and reduce arousal. Whereas intrapersonal experiences involving suppression of negative thoughts, emotions or memories which may increase arousal due to the physiological expression of distress when emotions are not processed, impacted on those individuals diagnosed with diffuse sclerosis experience of pain. Recognising that differences may occur between sclerosis groups for emotional responding to pain may be beneficial to inform treatment for this condition in the scleroderma population.

It is noteworthy that employing a dismissive style of attachment or utilizing a suppressive emotion regulation approach are avoidant strategies used by the two major subsets of scleroderma in this study, to manage painful emotions and thoughts. Although early experiences deficit in warmth and safety were not reported in the diffuse sclerosis group as a predictor of elevated levels of pain, the strategies to manage painful private experiences were similar in that both the limited and diffuse groups utilize avoidance as a coping strategy. These findings are consistent with research exploring the effects of thought suppression on the immune system and pain (Thomas et al., 2006). Diffuse sclerosis participants who utilized the avoidant strategy of suppression to evade distressing thoughts, feelings or memories; enable the inhibition of emotional expression associated with these experiences (Gross, 2009). It is possible therefore that the diffuse sample have experienced distressing memories that may have been experienced early in life that are the target for suppression. These individuals may therefore be avoiding expressing the emotional experiences associated with these memories

(Gross, 2002) and may not have accurately reported scores on the EMWS scale experiences, that are associated with immune dysfunction and elevated pain. Alternatively individuals with diffuse sclerosis may focus emotional avoidance strategies on negatively evaluated inner experiences as targets for avoidance or suppression (Hayes et al., 1996) and thoughts and behaviours that directly activate the threat system and initiate the stress response (Gilbert, 2007). Further research is required to investigate these suggestions.

As suppression of inner experiences may be an ineffective emotion regulation strategy that increases the occurrence of the distressing experience, this strategy may create recurring elevated physiological responses that increase exposure to physiological reactions and the perception of the severity of the pain experience. As many experiences of pain associated with scleroderma involve chronic pain, exposure to ongoing distressing inner experiences that could also be described as chronic experiences of stress or distress, may explain the elevated levels of pain experienced by those using avoidant strategies such as suppression and dismissive attachment in the current sample. Longer exposure to these inadequate cognitive and emotional appraisal strategies, may also explain why those individuals diagnosed with limited sclerosis at a later stage in life reporting early experiences deficit in warmth and safety and the utilization of strategies to avoid painful emotions through a dismissive style of relating, suffer more severe levels of pain.

Self-Kindness and Reactive Hyper-arousal Predict Elevated Raynaud's Symptoms

Low levels of self-kindness and reactive hyper-arousal in the total scleroderma sample significantly predicted more severe Raynaud's phenomenon (providing partial support for the hypothesis), generally the first symptom of scleroderma. Raynaud's phenomenon is a vascular disorder that involves the constriction of blood vessels generally in the extremities, such as the fingers and toes and can involve the internal organs (Baker & Denton, 2008). Raynaud's phenomenon may occur decades before the onset of the inflammatory stage of scleroderma

(Bolster & Silver, 2008) and is associated with physiological and emotional stress and a heightened stress response (Freedman & Ianni, 1983). Emotional stress is implicated in the physiological mechanisms that are involved in the constriction of blood vessels. Endothelial cells in the inner lining of the blood vessels interact with the circulation system to regulate immunological and inflammatory responses (Sumpio et al., 2002). Therefore individual's with scleroderma who use emotion regulation strategies that increase physiological responses, such as the release of chemicals involved in the stress response, that increase the constriction of blood vessels, may experience greater Raynaud's symptomology.

These experiences may explain why individuals with more severe Raynaud's symptoms were less likely to use emotion regulation strategies related to self-kindness and experience greater levels of reactive hyper-arousal. Low levels of self-kindness may create greater levels of reactive hyper-arousal, that increases the stress response and the constriction of blood vessels associated with Raynaud's. Hyper-arousal is associated with psychosocial stress and excessive arousal reactions that may create physiological responses, such as the constriction of blood vessels associated with Raynaud's phenomenon. Individuals diagnosed with scleroderma reporting elevated Raynaud's symptoms, were less likely to employ self-kindness to regulate their emotions and manage negative emotions, and more likely to employ strategies such as avoidance to manage distressing feelings and thoughts, rather than treating oneself with kindness and understanding. The incapacity to use self-kindness to regulate emotions may impede an individual's (with scleroderma) ability to change a negative self-view related to inner thoughts and emotions to a more positive one as they are less likely to engender kindness and understanding toward themselves (Neff, 2003a).

Individuals with a limited capacity to engage in self-kindness are less likely to be accepting toward their less favourable attributes and inadequacies when unable to manage a situation as well as expected. They may also have difficulty recognising that these aspects are

part of being human and that no one is perfect (Neff, 2003a). Engaging in kindness and understanding towards the self in situations where an individual experiences disappointment, emotional or physical pain and the capacity to be open to ones experiences without over identifying, may enable individuals with scleroderma to view adverse subjective experiences with kindness, to manage negative emotions (Neff, 2003a) and reduce the physiological response associated with reactive hyper-arousal. Scleroderma participants reporting low self-kindness may not only lack the resources to reduce arousal in stressful situations but may by their reactions to the event, increase their bodily response, increasing arousal levels as a result of not engaging self-soothing strategies, that may increase Raynaud's symptomology.

The findings in the current study are consistent with the research on psychosocial stress and physiological reactions of the neuroendocrine and innate immune systems by Pace and colleagues (2009). These findings suggest that stress induced immune and behavioural responses may be moderated by compassion focused meditations (Pace et al., 2009), while in other studies, self-compassion was associated with stress reduction (Sharpiro et al., 2005), lower cortisol levels (Pace et al., 2009), adaptive functioning and positive health outcomes (Neff et al., 2007). As self-kindness is concerned with being open to one's suffering with kindness and not utilizing strategies such as self-criticism or avoiding one's painful experiences; engaging in self-kindness as an emotion regulation strategy may reduce arousal levels when distressed and provide the majority of individuals with scleroderma who suffer elevated Raynaud's phenomenon with an ability to reduce physiological reactions to stress by not avoiding painful thoughts and emotions or engaging in negative self-evaluation.

It has been suggested that individuals diagnosed with Raynaud's phenomenon and scleroderma have a heightened stress response (Freedman & Ianni, 1983); as reactive hyper-arousal involves an intense response to unexpected stimuli and behaviours that involve cortisol and the stress response, engaging in emotion regulation strategies devoid or low in self-

kindness may increase a normally elevated stress response; further increasing arousal levels and impacting on the severity of Raynaud's symptoms, experienced by scleroderma participants. When the sample in the current study was divided into the two major subset of scleroderma (limited and diffuse sclerosis), results demonstrated that different variables were associated with Raynaud's phenomenon. Low self-kindness and reactive hyper-arousal predicted more severe Raynaud's symptoms for individuals diagnosed with diffuse sclerosis, whereas higher levels of self-judgment were associated with greater experiences of Raynaud's symptoms for individuals diagnosed with limited sclerosis.

These findings suggest that individuals with scleroderma, diagnosed with diffuse or limited sclerosis, utilize different negative emotion regulation strategies that impact on their experience of Raynaud's phenomenon. These differences may be due to different physiological and emotional responses to stress. Higher levels of self-judgment were found for the limited group when compared to the diffuse group who reported lower levels of self-kindness associated with elevated Raynaud's symptoms. Although hyper-arousal did not contribute to Raynaud's symptom severity in the limited sclerosis group, engaging in this negative emotion regulation strategy, low in self-compassion (self-judgment) may increase arousal levels, impacting on Raynaud's symptoms. It is also possible that individuals diagnosed with diffuse sclerosis may generally have a more heightened response to stress than the limited group. This reaction combined with emotion regulation strategies low in self-kindness, may increase physiological reactions and elevate hyper-arousal levels, responses that may partly explain the more severe general disease symptoms individuals diagnosed with diffuse sclerosis experience.

Findings also demonstrated that individuals with Raynaud's phenomenon had limited experiences of warmth and safety when compared to those individual's without a diagnosis of Raynaud's. As exposure to early life stress can influence a person's developing brain and the capacity to regulate emotions and reduce arousal levels in stressful situations throughout the

lifespan. It is possible these events may be a risk factor in the development of Raynaud's the first symptom of scleroderma (diagnosed as early as decades before the onset of the inflammatory stage of scleroderma, the stage when scleroderma is generally diagnosed).

It is likely that individuals diagnosed with scleroderma who have been exposed to adverse early life experiences may suffer Raynaud's phenomenon as a result of the cognitive and emotional experiences associated with feeling uncared for and unsafe and the contribution this stress exposure, along with a heightened stress response (Freedman & Ianni, 1983), may have on an individual's physiology. These early life experiences and the subsequent emotional and cognitive responses that are likely to increase arousal; may partially explain the Freedman and Ianni findings (1983), that individuals with both scleroderma and Raynaud's experience a heightened stress response. Chronic emotional and cognitive stress, may result in an individual remaining in a constant state of stress, that may constrict blood vessels and influence the development of Raynaud's phenomenon associated with scleroderma. This conclusion is supported by the findings that individuals diagnosed with Raynaud's reported fewer experiences of nurturing and feelings of safety in early life, than those individuals diagnosed with scleroderma without Raynaud's phenomenon.

Greater Reactive Hyper-arousal – Low Self-Kindness: Greater Scleroderma Disability

Findings partially supporting the hypothesis indicated that individuals reporting greater scleroderma disability also experienced significantly higher levels of reactive hyper-arousal. Reactive hyper-arousal involves an intense response to unexpected stimuli and behaviours that involve cortisol and the stress response that may increase scleroderma symptoms and level of disability experienced. When the diffuse and limited sclerosis groups were investigated separately low self-kindness was the only significant variable related to scleroderma disability experienced by individuals diagnosed with diffuse sclerosis.

Results indicated that individuals with diffuse sclerosis who experienced higher levels of

disability resulting from scleroderma symptoms, also experienced significantly lower levels of self-kindness. Self-kindness is concerned with being open to one's suffering with kindness and not using critical, judgmental or avoidant strategies to manage one's painful experiences. A lack of self-kindness may increase arousal levels when distressed, (Neff, 2003a/b) resulting in more severe levels of disability, due to a limited capacity to manage emotions and reduce physiological reactions to stress, in individuals diagnosed with diffuse sclerosis. Therefore strategies that reduce arousal such as self-kindness, may decrease the level of disability experienced by individuals diagnosed with diffuse sclerosis, who generally use emotion regulation strategies low in self-kindness.

Higher Suppression Predicts Elevated Breathing & Intestinal Issues in Diffuse Sclerosis

Findings suggested there were no meaningful relationships between intestinal or breathing problems and psychosocial variables for the scleroderma sample, and no difference in psychosocial variables for those individuals with and without intestinal or breathing conditions. When the diffuse and limited sclerosis groups were explored, correlation coefficients revealed that suppression was the only significant variable for intestinal and breathing problems in the diffuse sclerosis group. Results indicated that individuals with diffuse sclerosis who engaged in higher levels of suppression, experienced greater intestinal and breathing problems.

Suppression is an emotion regulation strategy that reduces awareness and expression of an emotion. The suppressed emotion; however, is expressed physiologically, increasing bodily responses that in the current scleroderma study were related to exacerbated gastrointestinal and breathing conditions, in individuals with diffuse sclerosis. As suppression is utilized to regulate excessive negative inner experiences (that over time are likely to increase in frequency and directly activate the threat system; Hayes et al., 1996); it is likely that that over time these avoidant strategies may influence functioning of the gastrointestinal and breathing systems or exacerbate the conditions due to the physiological process involved in elevated negative

arousal. Therefore individuals diagnosed with diffuse sclerosis who engaged in higher suppression, may experience poorer health outcomes for these conditions when compared to individuals with limited sclerosis who did not report elevated breathing and gastrointestinal conditions associated with psychological strategies for managing emotions.

Individuals diagnosed with scleroderma who use suppression, either consciously or unconsciously, as an emotion regulation strategy to manage negative emotions and memories, may experience physiological responses that vary considerably across the current sample. As suppression decreases the expression of the emotional experience and subsequently increases physiological responses (Gross, 2002); this strategy may produce heightened gastrointestinal and breathing responses that increase symptomology, in individuals diagnosed with diffuse sclerosis in the current study. These findings are consistent with research exploring suppression and physiological conditions such as immune dysfunction (Schore, 1994) and partially support the hypothesis.

Insecure Attachment and Suppression - Skin Severity

Findings supporting the hypothesis in the current study revealed significant differences between individuals (diagnosed with scleroderma) with mild, moderate and severe levels of skin thickening and psychosocial variables (EMWS, fearful and dismissive attachment and suppression). Lower EMWS and greater utilisation of suppression and insecure attachment styles (dismissive and fearful) were found for individuals with more severe skin thickening, when compared with the mild and moderate skin thickening groups. Findings indicated more negative outcomes for individuals who engaged in these avoidant emotion regulation strategies, in that these psychosocial experiences may impact on immune functioning and exacerbate scleroderma skin symptoms.

Findings that have not previously been found in this population, may be explained by the engagement of intrapersonal (suppression) and interpersonal and intrapersonal (fearful and

dismissive attachment) avoidant behaviours and the physiological responses resulting from these experiences that is likely to increase arousal. These avoidant and fear related strategies, do not effectively regulate emotions or down regulate arousal and appear to impact on scleroderma skin symptoms.

Differences in attachment experiences in individuals diagnosed with differing levels of skin severity and differences between groups for early life experiences low in warmth and safety, demonstrated that avoidance and insecurity may be experiences learnt in early life and factors that continue to impact on individuals in later life (diagnosed with scleroderma) with more severe skin conditions. As insecurely attached individuals tend to lack the resources necessary to cope successfully with and adapt to, adverse situations and generally appraise stressful situations as more demanding and difficult to manage, than securely attached individuals (e.g., Bowlby, 1998); protective strategies (such as suppression and insecure attachment styles) may have developed (as a result of adverse early life experiences) that have negatively influenced physiological responses, immune system functioning and the level of skin involvement found in the current study, in individuals diagnosed with scleroderma.

As the immune system is highly sensitive to psychosocial stressors (particularly when arousal levels are not reduced and homeostasis does not occur), the individual with scleroderma who utilizes avoidant strategies, may increase the risk of stimulating an autoimmune response and experiencing more severe levels of skin thickening. As insecure attachment involves the secretion of cortisol (a stress hormone that impacts on cells in the immune system) and as high levels of cortisol can be trigged by attachment insecurity, that may continue into adulthood (e.g. Arnetz & Ekman, 2006; Schore, 1994); the level of psychophysiological experiences an individual has endured, may influence the severity of skin thickening an individual diagnosed with scleroderma may experience.

Individuals diagnosed with scleroderma who reported a dismissive and/or fearful

attachment style and engaged emotion regulation strategies to suppress negative thoughts, emotions and memories, experienced more severe skin involvement than individuals diagnosed with scleroderma reporting less severe skin symptoms. As skin symptoms are a general gauge of overall severity of scleroderma symptoms (Steen & Medsgar, 2001); significant differences between groups in the current study suggests a link between protective avoidant threat strategies when relating to self and others, greater skin involvement and perhaps overall disease severity in individuals diagnosed with scleroderma. Therefore therapies that provide education around threat related arousal and the immune system in relation to interpersonal and intrapersonal communications; and strategies to manage avoidant emotion regulation, require investigation in this population to determine the effectiveness of reducing arousal on the exacerbation of scleroderma symptoms.

Hyper-arousal, and Self-Compassion were Linked to Early Onset of Scleroderma.

Results partially supported the hypothesis and demonstrated that hyper-arousal, over-identification and isolation (domains of low self-compassion) were significant for age diagnosed with scleroderma. Together these variables predicted age diagnosed with scleroderma, indicating that the younger an individual is diagnosed with scleroderma the more likely they have experienced greater levels of hyper-arousal and lower self-compassion. When diffuse and limited sclerosis were explored separately lower self-compassion (subscale, over-identification) and higher levels of hyper-arousal together predicted an earlier diagnosis of scleroderma for individuals diagnosed with diffuse sclerosis (however independently these variables were not significant).

Findings indicated that the younger an individual is diagnosed with diffuse sclerosis the more likely they will engage in the over-identifying strategy, low in self-compassion and experience increased levels of hyper-arousal. Therefore scleroderma participants diagnosed with diffuse sclerosis who utilize strategies low in self-compassion and experience heighted

levels of arousal (possibly due to inadequate emotion regulation strategies low in self-compassion that increase arousal), may influence bodily processes involved in the earlier development of scleroderma symptoms.

Hyper-arousal and strategies that increase arousal such as low self-compassion have the potential to influence immune functioning. Findings suggest that individuals who may be predisposed to developing scleroderma and utilize inadequate emotion regulation strategies (low in self-compassion) that increase arousal levels to the stage where autoimmunity occurs, may be prone to an earlier diagnosis of scleroderma. Therefore education that informs counsellors about the negative potential of engaging in low self-compassion on the immune system (autoimmunity), may provide preventative opportunities (reducing the incidence of autoimmunity), through treatment methods based on developing self-compassion.

Insecure Attachment, Self-Compassion & Suppression - Predict Early Onset Raynaud's

Scleroderma: Results revealed meaningful relationships between the dependant variable age diagnosed with Raynaud's phenomenon and the independent variables over-identification and isolation (low self-compassion). Although neither variable was a significant unique predictor of age diagnosed with Raynaud's, together this model was significant. As over-identification and isolation indicated lower levels of self-compassion and are strategies that may increase physiological arousal; these factors may have some influence on an earlier development of Raynaud's phenomenon.

Individuals with Scleroderma and those also diagnosed with scleroderma and Raynaud's phenomenon who reported low self-compassion may have limited experiences of compassion as a result of not receiving warm nurturing experiences at an earlier time in their life. These individuals therefore, may not have developed strategies involving self-kindness in situations where they experienced stress, distress or disappointment. These individuals may over-identify with the subjective experience and/or emotions related to feeling isolated, reducing the

opportunity to decrease the impact of the negative experience and the ability to manage an elevated threat response (Gilbert, 2007; Neff, 2003a). These experiences may have influenced immune functioning and an earlier diagnosis of Raynaud's phenomenon in individuals diagnosed with scleroderma.

Diffuse & Limited Sclerosis: When the two major subsets of scleroderma (diffuse and limited sclerosis) were explored independently, over-identification for the diffuse group and dismissive attachment and suppression for the limited group demonstrated meaningful relationships for age diagnosed with Raynaud's phenomenon. Therefore individuals with diffuse sclerosis were more likely to over-identify with their experiences, a strategy that may increase physiological arousal impacting on immune system responses and an earlier diagnosis of Raynaud's for the diffuse sclerosis group.

Findings for the limited sclerosis group indicated that the younger an individual was diagnosed with Raynaud's phenomenon, the more likely they would utilize the emotion regulation strategy suppression and engage in a dismissive style of relating to attachment figures, both of which are avoidant emotion regulation strategies. Insecurely attached individuals generally do not feel safe and secure when exposed to stressful or threatening situations, thereby increasing the likelihood of experiencing long term effects of the stress evoking event that may elevate physiological responses, and possibly immune functioning associated with an earlier diagnosis of Raynaud's phenomenon, in individuals diagnosed with scleroderma. Whereas individuals who engaged in suppression as an emotion regulation strategy, tend to experience an increase in the occurrence of the distressing experience, a strategy that may create recurring elevated physiological responses, that can impact on immune responses and in this study, a greater likelihood of experiencing an earlier diagnosis of Raynaud's phenomenon in those with limited sclerosis.

Individual differences in emotion regulation strategies of suppression and over-

identification and avoidant styles of relating (dismissive attachment) to significant others may be a determining factor in relation to coping strategies used by individuals diagnosed with the major subsets of scleroderma when managing stress. These strategies that are likely to increase arousal may influence processes that initiate physiological responses involved in the development of Raynaud's phenomenon, generally the first symptom of scleroderma. As the onset of Raynaud's can occur up to decades before a diagnosis of scleroderma for those with limited sclerosis, these strategies may in part contribute to an earlier onset of Raynaud's phenomenon and the process involved in initiating the development of scleroderma.

Self-Compassion and Age Diagnosed with Scleroderma Predict Hyper-arousal

Results demonstrated that self-compassion and age diagnosed with scleroderma predicted hyper-arousal in individuals diagnosed with scleroderma, indicating that individuals diagnosed with scleroderma, who utilized strategies low in self-compassion and were diagnosed with scleroderma at a younger age, were more likely to experience greater levels of hyper-arousal. Therefore engaging in emotion regulation strategies low in self-compassion and experiencing elevated hyper-arousal may influence immune functioning, by initiating an autoimmune reaction that may result in an earlier diagnosis of scleroderma. An inability to treat oneself with compassion and reduce the emotional and physiological response associated with arousal linked to immune functioning; may generate an earlier onset in those individuals diagnosed with scleroderma, who utilize emotion regulation strategies that reduce the capacity to self-sooth and manage the threat response.

Reactive hyper-arousal a subscale of hyper-arousal demonstrated different predictor variables to hyper-arousal that included Raynaud's phenomenon, a dismissive attachment style and low self-compassion (over-identification) for individuals diagnosed with scleroderma. Results indicated that individuals diagnosed with scleroderma who experienced more severe Raynaud's symptoms, a dismissive attachment style and a tendency to over-identify with their

situation, were likely to experience greater levels of reactive hyper-arousal. Results indicated that these more reactive individuals (with scleroderma) may be more likely to react intensely to unexpected stimuli and have difficulty discriminating between physiological sensations that are harmless, and threatening sensations that involve cortisol arousal. These experiences may result in a difficulty adapting to recurring stimuli that may increase arousal levels.

Individuals diagnosed with scleroderma who generally experience heightened arousal may use inadequate emotion regulation strategies likely to engage the threat response, possibly due to exposure to early life stress, low in compassion and limited opportunities to develop self-soothing strategies. This situation may have created long term exposure to heightened levels of arousal early in life; or alternately scleroderma participants reporting hyper-arousal may have a genetic predisposition to hyper-arousal such as a heightened stress response, findings consistent with Ianni and Freedman's research (1983). Chronic states of hyper-arousal whether generated biologically, or physiologically induced through personal experience, may have impacted on the immune system and increased the likelihood of developing Raynaud's phenomenon.

Summary of Predictor Variables for Scleroderma Symptoms

Severity of scleroderma symptoms were associated with and predicted by a number of variables that have supported a pattern of experiences and strategies reported in the literature as associated with elevated physical reactions and immune related responses.

These early life experiences and avoidant (threat related) emotion regulation strategies that generally increase arousal, as hypothesised either predicted or were associated with scleroderma symptoms, disability and pain. Severity of symptoms in individuals diagnosed with diffuse and limited sclerosis, were generally related to different psychosocial variables and may be the result of different physiological and emotional responses to stress. These results partially supported the hypotheses.

Diffuse Sclerosis: Individuals diagnosed with Diffuse sclerosis who engaged in strategies

high in suppression or reported using emotion regulation strategies low in self-compassion (such as over-identifying with their situation), a strategy likely to elevate the fight and flight response tended to report more negative health outcomes.

Limited Sclerosis: Whereas limited early life experiences around nurturing and safety and the development of fear related protective strategies involving insecurity (insecure attachment styles dismissive and fearful) and avoidance (suppression of negative inner experiences) were significantly related to scleroderma symptoms and pain.

Similarities/Differences between Groups: Avoidance was utilized by both diffuse and limited groups as a strategy to regulate emotions; however, this approach appears to exacerbate scleroderma symptoms, perhaps due to increased levels of arousal. Different avoidant strategies generally predicted scleroderma symptoms in the two groups. The diffuse groups' greater utilization of emotion regulation strategies low in self-compassion and high in suppression were likely to increase arousal levels and initiate the fight and flight response impacting on immune system functioning, thereby exacerbating scleroderma symptoms. Individuals diagnosed with limited sclerosis who may have experienced adverse early life experiences, tended to engage avoidant emotion regulation strategies and attachment styles that may also initiate the threat response, impacting on the immune system and elevating scleroderma symptoms.

Although variables tended to differ between individuals, the severity of symptoms appears to relate to experiences and strategies that increase the threat response, immune functioning, and an earlier onset of Raynaud's phenomenon and scleroderma. Raynaud's phenomenon the first symptom of scleroderma can occur decades before the onset of scleroderma, particularly in individuals diagnosed with limited sclerosis.

This suggests that early adverse experiences and the resulting emotional and cognitive strategies may create a chronic state of hyper-arousal that engages the threat system, an autoimmune response and an earlier diagnosis of Raynaud's, for individuals with limited

sclerosis.

What Predicts Depression, Anxiety and Stress in Individuals with Scleroderma

Depression

A majority of individuals (58%; diagnosed with scleroderma) in the current study reported experiencing elevated levels of depression. Thirty six percent experienced mild depression, 11% reported moderate depression while 11% experienced severe levels of depression. The remaining participants experience some depressive symptoms (although not clinical levels), indicating that all participants in this study experienced some depressive symptoms. The current findings are considerably higher than prevalence rates in community samples (APA, 2013); however, they are consistent with previous studies on depression and scleroderma by Thombs et al., (2007); Beretta et al., (2006); Daniele et al., (2005); Angelopoulos et al., (2001) and Roca et al., (1996) that identified high levels of mild to severe depression in 33% to 65% of individuals diagnosed with scleroderma.

Findings in the current study revealed that EMWS and fearful attachment predicted elevated levels of depression in individuals diagnosed with scleroderma. Levels of depression in the total scleroderma sample were likely to be more severe, in individuals who have been exposed to stressful early childhood experiences low in warmth, emotions associated with feeling safe and secure and a fearful style of relating to attachment figures. Depression resulting from early life stress may activate physiological systems involving an increase in cytokine secretion and hyperactivity of the HPA-axis affecting immune system functioning.

Fearfully attached individuals with scleroderma in the current study were likely to have a negative view of themselves and others and engage in avoidant emotion regulation strategies, likely to impact on the ability to reduce arousal and disengage the fight and flight response in stressful situations. Engaging in a fearful attachment style that may have developed as a result of exposure to experiences low in warmth and safety and possibly high

in fear and threat, are therefore likely to increase symptoms of depression associated with threat processing deficits and stress hormones in individuals diagnosed with scleroderma.

More severe depression was also experienced by individuals diagnosed with limited sclerosis (in the current study), who engaged in a greater utilization of suppression as an emotion regulation strategy and reported limited experiences of EMWS. These individuals were likely to engage the threat system through the use of avoidant strategies such as suppression or emotions associated with threat such as feeling unsafe and uncared for. These strategies may negatively impact on communications between the neural, endocrine and immune systems, reducing serotonin receptors and increasing the experience of depression and symptoms such as worthlessness, hopelessness and sadness associated with these early life experiences.

In the diffuse sclerosis group those diagnosed with Raynaud's phenomenon and who have a tendency to use over-identification strategies were likely to experience elevated levels of depression. These individuals were likely to experience higher levels of depression, possibly due to chronic focusing on their experience, which may have been interpreted as threatening, impacting on their experiences of helplessness and hopelessness, symptoms associated with depression. When comparing specific scleroderma symptoms, findings revealed that individuals reporting scleroderma symptoms of pain, Raynaud's phenomenon and finger ulcers, experienced greater levels of depression, when compared to individuals (with scleroderma) without these specific scleroderma symptoms.

These findings are consistent with those found for individuals diagnosed with Raynaud's in the diffuse sclerosis group, who experienced more severe levels of depression. Raynaud's phenomenon and finger ulcers were associated with considerable pain and disability and these experiences may possibly increase the individual's feelings (diagnosed with scleroderma) associated with a lack of control over their disease, elevating depressive

symptoms such as feelings of sadness and hopelessness.

Overall the results demonstrated that depression was not only related to some specific scleroderma symptoms and greater Raynaud's severity but also to psychosocial aspects including early life stress, strategies that involve the threat and immune systems and limited internal (e.g., suppression, low self-compassion and insecure attachment) and external resources (fear related to relying on others in times of need) to manage stress. These findings add to the literature on disease symptoms (Raynaud's phenomenon) and psychosocial aspects involving early childhood stress and cognitive and emotional strategies; that suggest that the threat and immune systems are likely to underlie the experience of depression in some individuals diagnosed with scleroderma. The results suggest significant relationships between depression and early life experiences, insecure attachment and inadequate emotion regulation strategies; and the need to assess these experiences in individuals diagnosed with scleroderma to inform treatment of depressive symptoms.

Anxiety

Eighty per cent of individuals in this study reported experiencing anxiety with 23% experiencing mild levels of anxiety, 44% reporting moderate anxiety and 13% experiencing severe levels of anxiety. The remaining participants also reported some anxiety symptoms indicating all participants reported experiencing some level of anxiety. These figures are consistent with prevalence rates of anxiety of 83% in individuals diagnosed with scleroderma reported by Legendre and colleagues (2005). Variables that predicted the high prevalence of anxiety in the total scleroderma sample included scleroderma specific symptoms and psychosocial factors. Scleroderma related breathing problems, low experiences of early memories of warmth and safety and the ineffective emotion regulation strategy suppression, predicted elevated levels of anxiety in individuals with scleroderma. These variables also predicted higher levels of anxiety for individuals diagnosed with limited sclerosis.

Scleroderma disease symptoms in the diffuse sclerosis group did not predict anxiety; however, similar findings for the psychosocial variable, early experiences of warmth and safety (found in the limited and scleroderma groups) were also found in the diffuse group. Greater feelings of isolation (and not suppression), however, predicted greater levels of anxiety in the diffuse group. Findings indicated that for the total sample, higher levels of anxiety were likely to be experienced by scleroderma participants who have experienced lower levels of warmth and safety in their childhood and for the limited sample this variable together with higher levels of suppression and more severe scleroderma related breathing problems, predicted greater anxiety. For the diffuse group, EMWS and increased experiences of feeling isolated (low self-compassion) predicted elevated levels of anxiety.

These results suggest that while EMWS predicted anxiety in both groups; different scleroderma symptoms and psychosocial variables (other than EMWS) predicted elevated anxiety in individuals diagnosed with diffuse and limited sclerosis. Findings are consistent with research on negative early experiences low in warmth, nurturing and safety and the development of anxiety (Gilbert, 2008) and emotion regulation strategies such as suppression and avoidance (Gross, 1998; Hayes et al., 1996; Iwamitsu et al., 2005).

Heightened levels of anxiety in the current study for some individuals, were likely to result from early experiences associated with stressful psychosocial environments, involving chronic exposure to stress and the development of ineffective emotion regulation strategies that may create a physiological stress response. Exposure to prolonged stressful psychosocial experiences early in life has the potential to negatively impact on neural-endocrine and immune interactions (Arnetz & Ekman, 2006). Individuals diagnosed with scleroderma exposed to early prolonged levels of stress, may have developed a hyper-vigilance to threat that engages the fight and flight response and the development of suppression as an avoidant strategy, to manage the stressor and heightened levels of anxiety.

Early experiences of chronic stress may therefore impact on the ability of individual's with scleroderma to develop adaptive psychological strategies and may affect functioning of physiological systems such as those involved in breathing. Scleroderma participants reporting elevated levels of anxiety who have suffered frequent negative childhood events may experience difficulty regulating the emotional response to stressors, due to a lack of opportunity to develop the self-soothing social mentality and the capacity to reassure (Gilbert et al., 2004) when distressed.

These individuals may also lack the experience and capacity to believe they are worthy of care or that others will be there for them in time of need; experiences that may result in elevated feelings of isolation. Consequently these experiences may result in the use of maladaptive cognitive and emotional strategies that may generate a physiological stress response (Neff, 2003a; Mills, 2005) and impact on scleroderma participant's levels of anxiety. Scleroderma participants who have experienced early stress environments and developed a limited capacity to use calming strategies, may lack the resources to regulate negative emotions and therefore utilize suppression as an avoidance strategy; to manage unpleasant feelings or to disengage from the threatening situation (Langens & Morth, 2003).

Early memories associated with feeling unsafe and uncared for and adult experiences of isolation (low self-compassion) were also likely to elevate the experience of anxiety in those diagnosed with diffuse sclerosis. These early childhood experiences may not only have impacted on the individuals capacity to connect with others and understand that other people suffer similar human conditions, but also their expectations that others are willing to be supportive. This way of thinking is likely to increase individuals with diffuse sclerosis feelings of isolation and impact on the level of anxiety experienced.

Results also demonstrated that individuals reporting pain resulting from scleroderma symptoms, experienced higher levels of anxiety than those diagnosed with scleroderma

without associated pain. This may be explained by findings that suggest pain is a subjective experience associated with tissue damage. Pain is therefore perceived as physiological as well as psychological, with the psychological aspects of pain playing a greater part in the experience of pain when it becomes chronic; as it involves sensory, emotional and cognitive experiences that require attention and interpretation (Lee-Chiong et al., 2010). Individuals who experience anxiety may therefore engage in emotions that increase the experience and perception of pain (physiologically and/or emotionally) due to an inability to self-sooth and reduce arousal in fearful or threatening situations.

The findings in the current study are consistent with research conducted by Tan and colleagues (2008) in that, individuals experiencing anxiety reported elevated levels of chronic pain. The reporting of experiences of pain may therefore reflect not only a physical expression of pain but also a subjective component involving the interpretation of sensory experiences that are likely to elevate levels of anxiety.

Individuals diagnosed with Raynaud's reported higher levels of anxiety than those individual's without a diagnosis of Raynaud's. As research demonstrates that individual's diagnosed with both Raynaud's and scleroderma have a heightened stress response (Freedman & Ianni, 1983); this response may impact on the emotional and/or subjective experience of the individual and subsequently increase the experience of anxiety. Although results suggest that early social experiences of nurturing and feeling safe were similar for the limited and diffuse groups for some variables, different psychological and biological predictor variables were found for these groups and also for those with different scleroderma symptoms. These findings suggest that early childhood experiences and the subjective interpretation of individual's experiences, may impact on scleroderma symptoms and elevated levels of anxiety.

Stress

Age diagnosed with Raynaud's phenomenon predicted stress in the scleroderma sample, indicating that the earlier an individual with scleroderma was diagnosed with Raynaud's phenomenon the greater their current experiences of stress. Individuals diagnosed with Raynaud's also reported higher levels of stress than those individual's without a diagnosis of Raynaud's. Therefore the earlier an individual is diagnosed with Raynaud's phenomenon the greater the experience of stress; these findings may reflect the suggestion that individuals diagnosed with scleroderma and Raynaud's phenomenon have a heightened stress response and therefore these findings have implications for treatment. Education that informs counsellors about this heightened stress response in those with Raynaud's and scleroderma may improve outcomes, in that strategies that effectively manage stress may be provided for these individuals.

Drawing on the findings in the current study: Results could reflect individual's (diagnosed with scleroderma) exposure to biopsychosocial stress and the limited resources to manage cognitive and emotional experiences of stress, that may result in chronic states of fight and flight, an elevated level of stress and an earlier diagnosis of Raynaud's; generally the first symptom of scleroderma.

Therefore an inability to manage stress over long periods of time may affect the bodily processes involved in the fight and flight response such as the constriction of blood vessels and an earlier onset of Raynaud's phenomenon. Conversely these results may reflect longer exposure to the symptoms associated with Raynaud's that have increased the current experience of elevated levels of stress; or an innately heightened stress response that may have initiated an earlier diagnosis of Raynaud's. These results do however reflect that heighted levels of stress are linked to an earlier diagnosis of Raynaud's.

Findings also demonstrated that over-identification (low self-compassion), a cognitive and emotional experience involving the threat response, was likely to be reported by individual's diagnosed with diffuse sclerosis experiencing more severe levels of stress. These individuals were likely to focus attention on their negative experience, engaging the fight and flight response and increasing the experience of stress. Elevated stress was also experienced by individuals diagnosed with limited sclerosis reporting lower childhood exposure to feeling cared for and safe; experiences also associated with the threat response and inadequate emotion regulation strategies. An inability to manage negative emotions associated with a lack of nurturing and feelings of safety and security over long periods of time may heighten physiological responses to stressors (experienced as chronic stress) that may underlie the current reporting of elevated stress by individuals diagnosed with limited sclerosis.

A difference was also reported for individuals experiencing different scleroderma symptoms. Individuals with intestinal complaints reported greater levels of stress than those without this condition. These results are consistent with (Tache et al., 2001) findings that stress has the potential to generate alterations in gastro-oesophageal functioning as part of physiological changes that occur during a response to stressors. Individuals reporting pain resulting from scleroderma symptoms, also reported more severe levels of stress than those diagnosed with scleroderma without associated pain. As the literature describes pain as a subjective experience associated with personal experience (Lee-Chiong et al., 2010) and as early stress experiences may result in ineffective emotion regulation strategies associated with the threat system and immune activation (e.g., Gilbert et al., 2008), these stressful psychosocial aspects may partially explain the elevated levels of pain.

Physiological pain and disability associated with scleroderma symptoms may also partially explain greater reporting of stress when compared to individuals without these pain experiences. Stressors generally do not elicit the same response, thereby effecting each

individual differently as a result of a number of factors, such as genetic predispositions, gender, exposure to stressful social environments, age of exposure and coping strategies. These aspects may reflect in part the difference in stress experienced by those individuals diagnosed with scleroderma. As psychological stress involves an evaluation of any particular circumstance as exceeding the capacity of an individual to manage any situation or experience that may potentially endanger their well-being (Lazarus & Folkman, 1984). The type of strategies used by individuals diagnosed with scleroderma to manage negative stress arousal may explain the difference in variables in the current study related to psychological and physiological symptom severity in individuals diagnosed with scleroderma.

The ability to manage the negative cognitive and emotional responses that may occur as a result of early life stress and the capacity to effectively manage emotions associated with living with a chronic and life threatening disease were factors that were likely to impact on elevated levels of stress and an earlier diagnosis of Raynaud's phenomenon for some individuals diagnosed with scleroderma. It should be noted that the sample size obtained for this study was rather small for the number of variables used to measure the relationship between disease symptoms and onset and is a limitation in this study.

Recommendations

Living with a complex chronic and potentially life threatening disease (that has no known cure) and experiencing negative cognitive and emotional strategies that reduce the likelihood of effectively managing emotions and thoughts, reflects greater scleroderma symptomology. Developing strategies that involve awareness and understanding of experience (rather than avoiding, suppressing or over-identifying) may assist individuals diagnosed with scleroderma to reduce the physiological response to stress and immune reaction associated with elevated scleroderma symptoms.

Education around individual thinking patterns and levels of negative arousal and the likely impact on an individual's specific set of scleroderma symptoms, may provide some insight into each individual with scleroderma's current copying style. The intention of this education would be to motivate this population to engage in therapeutic techniques that reduce negative arousal to improve current psychological and physiological health.

Further research (involving individuals with scleroderma) that focuses on psycho-education around immune activation; engaging in compassion focused and cognitive behavioural therapies that involve mindfulness; to develop skills that effectively manage emotions, reduce arousal and exacerbation of scleroderma symptoms requires investigation.

Limitations

As scleroderma is a rare disease it was difficult to gain a large sample in a country with a small population such as Australia compared with countries with a greater population pool to draw from such as the UK and USA. Although an international population was sought from which to collect data to gain the necessary participant numbers, to complete a research project of this type (that is with a large number of variables). Participant numbers were lower than expected and as a result impacted on what analysis were conducted. The low participant numbers in relation to number of variables and analysis in this study is therefore also a limitation. Post-hoc power calculations were therefore conducted to measure adequate power. Power was found to be adequate for all significant findings. The pattern resulting from all findings indicated a link between experiences and strategies that are likely to engage the fight and flight response and possibly impact on immune functioning. Therefore although the number of participants was smaller than anticipated the sample indicated a relationship between scleroderma symptom severity, strategies and experiences that the literature suggests are linked to immune dysregulation and the possible development of autoimmunity (in this study a link to scleroderma). The type of measures used to determine scleroderma symptom

severity is also a limitation as self-report rating scales provide a subjective view of an individual's symptomology rather than an objective assessment of an individual's health as determined by a medical measure.

Conclusion

The findings in the current study are consistent with Gilbert's biopsychosocial theory of social mentalities that postulates experiencing early environments deficient in compassion, tend to impact on an individual's capacity to develop the self-soothing social mentality and use self-soothing strategies. These individuals are likely to function in the threat mentality due to internalising early life experiences of external threat and engaging ineffective avoidant emotional regulation strategies to manage stress or distress (e.g., Gilbert, 2000; Gilbert, 2002; Gilbert, 2012). Findings suggest that individuals diagnosed with scleroderma may have different copying styles when managing stress as a result of varying positive and negative inter-personal experiences in early life that involve attachment. These experiences may have created ways of relating to self and others (e.g., levels of self-compassion and emotional suppression and adult attachment strategies) that to varying degrees, either elevate or reduce arousal levels (hyper-arousal) dependant on whether the type of strategies used, engage the threat mentality or self-soothing social mentality (Gilbert, 2000). These strategies may impact of how the individual responds to stress events (such as receiving a diagnosis of a rare disease that has a high mortality rate, no cure and symptoms that affect the sufferer's level of functioning). The way individuals cope and adapt to situations and their capacity to reduce arousal in a short time-frame may explain the difference in variables related to psychological and physiological symptom severity, in individuals diagnosed with scleroderma.

Effective or ineffective management of negative intra-personal and inter-personal experiences may also result in a vulnerability to psychological conditions such as anxiety and depression (e.g., Gilbert, 2007; Gilbert, 2012) and immune dysregulation (Schore, 1994) that

may impact on scleroderma symptomology. Threatening early life experiences, deprived of warmth and safety tend to limit the activation of the self-soothing mentality and would be generally more likely to stimulate the threat system and subsequently the development of defensive strategies (e.g., Gilbert et al., 2008; Irons, Gilbert et al., 2006) such as avoidance behaviours and emotional suppression (Gross, 2002), to prevent engagement in the fearful or threatening situation (Langens & Morth, 2003). The current study has expanded on Gilbert's research through the exploration of early life stress and strategies associated with activation of the threat system and the relationship to disease symptomology.

Elevated biologically related scleroderma symptoms and psychosocial experiences in the current study reflect emotional and physiological responses likely to engage the fight and flight response involved in the threat system and immune related functioning associated with an earlier onset of disease symptoms and elevated symptomology. Early life stress associated with low experiences of warmth, and feeling safe and secure can affect an individual's ability to regulate their emotions and calm the threat response.

Insecure attachment styles such as dismissive and fearful attachment also engage the threat system, through the use of avoidant strategies or emotions associated with fear and feeling unsafe. Emotion regulation strategies such as suppression, and low self-compassion (over-identification, self-judgment, feelings of isolation, and a limited ability to provide oneself with kindness) and self-soothing reflect inadequate emotion regulation strategies, and a limited capacity to rely on significant others; and for some people stressful early life experiences and attempts to manage adversity with limited internal and external resources.

While both groups reported early life experiences as impacting on their physical or psychological functioning, the diffuse group tended to use emotion regulation strategies that were likely to increase arousal levels, the fight and flight response, immune system functioning and increase scleroderma symptomology. While individuals with limited sclerosis

tended to report negative early life experiences, avoidant emotion regulation and attachment styles also associated with the threat system, as impacting on severity of scleroderma symptoms. Although variables differed between individuals, the severity of symptoms appeared to relate to interpersonal and intrapersonal experiences and strategies that increase the threat response, immune functioning, and an earlier onset of Raynaud's and scleroderma disease symptoms.

Mental health variables depression, anxiety and stress were also related to scleroderma symptoms, early life stress and cognitive and emotional strategies such as low self-compassion that involve the threat response, immune system functioning and the capacity to manage stress.

CHAPTER FOUR - STUDY TWO: SCLERODERMA AND COMMUNITY STUDY

Introduction - Comparison Study between Community and Scleroderma Groups

Findings from the first study indicated that lower early life experiences related to warmth and safety, emotion regulation and physiological responses such as hyper-arousal (experiences likely to involve the threat mentality and the fight and flight response) predicted a variety of scleroderma related conditions and psychological symptoms such as depression and anxiety. The literature suggests that early social experiences involving low warmth and safety and inadequate strategies for managing stress and emotions, may increase physiological arousal over extended periods of time and impact on immune system functioning and physiological and psychological health (Arnetz & Ekman, 2006; Lekander, 2002; Maier & Watkins, 1998; Schore, 1994).

Investigating whether these experiences were as likely to occur in the general population, was the focus of the second study. This study investigated whether negative rearing experiences and significant psychosocial variables explored in the scleroderma study were also common in community individuals without this illness. The aim was to demonstrate the likelihood that these variables may contribute to the psychopathology experienced by

individual's diagnosed with scleroderma and the development or earlier onset of scleroderma; and therefore not found to the same degree in the community sample. It was anticipated that individuals from the community sample would have more positive early life and attachment experiences, a greater capacity to engage in self-compassion and lower experiences of arousal than scleroderma participants. Participants for the community study where recruited from Bond University first year psychology students and individuals from local sporting clubs.

Study Two: Hypotheses

Hypothesis one: Lower levels of EMWS, inadequate Emotion Regulation, (low Self-Compassion and higher Suppression) an Insecure Attachment Style (Dismissive and Fearful) and higher levels of Hyper-arousal would be reported by individuals diagnosed with Scleroderma when compared with Community participants without a diagnosis of Scleroderma.

Hypothesis two: Individuals diagnosed with Scleroderma would report higher levels of Anxiety, Depression and Stress when compared would individuals from the Community sample without a diagnosis of Scleroderma.

Hypothesis three: Higher levels of Anxiety, Depression and Stress would be found between the Diffuse sclerosis group when compared with the Community group and Limited sclerosis group when compared with the Community group.

Hypothesis four: Lower levels of EMWS, inadequate Emotion Regulation, (limited experiences of Self-Compassion and higher Suppression) an Insecure Attachment Style (Dismissive and Fearful) and higher levels of Hyper-arousal would be reported between the Diffuse sclerosis group when compared with the Community group and between the Limited sclerosis group when compared with the Community group without a diagnosis of scleroderma.

Method

Participants

Male and female adults aged 18 years and over who had not been diagnosed with Scleroderma were invited to participate in this research project. One hundred and six Bond University psychology students and individuals from the general community completed either the online or hardcopy questionnaire.

Measures

The measures were the same as those included in study one with the exclusion of the Scleroderma Health Assessment Questionnaire SHAQ: Steen & Medsger, 1997). These questionnaires were the Early Memories of Warmth and Safeness Scale (EMWS: Richter, Gilbert & McEwan, 2009), the Relationship Scale Questionnaire (RSQ: Griffin & Bartholomew, 1994), the Emotional Regulation Questionnaire (ERQ: Gross & John, 2003), the Self-Compassion Scale (SCS: Neff, 2003), the Depression, Anxiety and Stress Scale (DASS21: Lovibond & Lovibond, 1995) and the Hyper-arousal Scale (HS: Hammond, Barsky, & Regestein, 2001). Additional questions such as diagnosis of scleroderma or other autoimmune disease were included.

Procedure

Non Scleroderma participants were recruited through Bond University and in the general community. Participants included Bond University psychology students who were recruited through notices posted on the Research Participation Notice board of the HSS Faculty, within the Psychology Department, informing potential participants of the research. Participants were also recruited from non-biological relatives and friends of people diagnosed with scleroderma by scleroderma associations. The general community sample also included people from a wide range of ethnic, socioeconomic and educational backgrounds that were involved in local sporting competitions (tennis, golf and bowls). This population was

included in the study as being active is generally perceived as healthy.

As scleroderma is generally diagnosed later in life and mostly in women, all participants were assessed for suitability to be included in the study, in that individuals were matched for gender and age (between 26 and 80 years, mean age 56) with those in the scleroderma study.

Results

Study Two: Overview of Analyses

Analysis was performed using SPSS version 18. Frequencies revealed an age range between 18 and 76 years in the community sample. Individuals are generally diagnosed with scleroderma after the age of thirty years and are predominately female, therefore it was necessary to match participants in the community sample for age and gender. The youngest age for scleroderma participants in the current study was 26 years; eight participants in the community sample aged below the age of 26 were therefore removed from the analysis. The age range for participants in the community sample (individuals without a diagnosis of scleroderma), entered into analysis was between 28 and 76 years with a mean age of 48.

Frequencies for the demographic and health information revealed a total of 75 community participants (54 females, 19 males, two participants failed to complete this information); 64 participants were from Australia, two were from the UK, one from the USA, and five from European Countries; three participants did not supply this information. Three participants reported gaining a primary school education, 34, reported a secondary school education with 26 and seven participants reporting tertiary and post graduate education respectively, five participants did not supply this information. Scleroderma and community data files were merged to conduct comparison analysis to address the hypotheses.

T-Tests and MANOVA were conducted as well as non-parametric analyses (Mann Whitney U and Kruskal-Wallis tests) due to skewed data. Cronbach's alpha revealed the

variables Depression, EMWS, Dismissive and Fearful Attachment were above .90, the variables Stress, Hyper-arousal, Self-Compassion and the subscales Self-kindness, over-identification and mindfulness were (when rounded up) .80 or above; the variables Anxiety and Suppression were .70 or above, Reactive Hyper-arousal was .62 with an acceptable inter-item mean of .35; demonstrating that these scales had good internal consistency.

Statistical Analysis: Comparison Study - Scleroderma and Community

Missing data was evident throughout the data. The pattern appeared random for all completed scales. T-Tests and a MANOVA were performed to address the first hypothesis; that individuals diagnosed with Scleroderma would report lower levels of Self-Compassion, Emotion Regulation, EMWS, and an Insecure Attachment Style and higher levels of Hyper-arousal when compared with Community participants without a diagnosis of Scleroderma. Preliminary assumption testing was conducted. The variables that met the assumptions were analysed utilizing parametric tests. T-Tests revealed significant mean differences between groups (Scleroderma and Community).

EMWS: Individuals with Scleroderma reported lower levels of EMWS (M = 70.03, SD = 23.94) than the no scleroderma group; M = 78.65, SD = 20.22, t (148) = 2.31, p = .022, the magnitude of the mean difference = .85, 95% CI: .1.25 to 15.98 (eta Squared =. 038).

Self-Compassion: Lower levels of Self-Kindness (SCS), (M = 13.61, SD = 4.80) than the No Scleroderma group; M = 15.81, SD = 4.46; t (137) = 2.75, p = .007, the magnitude of the mean difference = .85, 95% CI: 0.62 to 3.79 (eta Squared =. 05) and lower Mindfulness (SC), (M = 12.80, SD = 3.36, than the No Scleroderma group; M = 13.95, SD = 2.95; t (137) = 2.08, p = .039 the magnitude of the mean difference = .85, 95% CI: .058 to 2.23 (eta squared = .03). One way between groups multivariant analysis of variance was performed entering significant variables; preliminary assumption testing was conducted with no violations noted. Means, Standard Deviations and T-Tests for EMWS, Self-kindness and

Mindfulness are presented below in Table 13.

Table 13

T-Tests for Scleroderma/No Scleroderma groups for Depression, Anxiety and Stress

Variable	*M*	*SD*	*t*
EMWS			
Scleroderma	70.03	23.94	
Community	78.65	20.22	
T-test			2.31*
Self-Kindness			
Scleroderma	13.61	4.80	
Community	15.81	4.46	
T-test			2.75**
Mindfulness			
Scleroderma	12.80	3.36	
Community	13.95	2.95	
T-test			2.08*

*$p < .05$ **$p < .01$ ***$p < .001$

There was a significant difference between individuals diagnosed with Scleroderma and those without a diagnosis of Scleroderma on the combined dependant variables, Wilks' Lambda F (3,131) = 2.80, p = .042. When the results for the dependent variables were considered separately all variables reached statistical significance, early memories of warmth and safety (EMWS), F (1, 133) = 4.26, p = .041, partial eta = .03 (3.1% of the variance), Self-Kindness, F (1, 133) = 6.26, p = .014, partial eta = .045 (4.5% of the variance) and Mindfulness F (1, 133) = 4.00, p = .048, partial eta = .03 (2.9% of the variance). Inspection of mean scores indicated that individuals with Scleroderma reported lower EMWS (M = 69.67, SD = 23.90), than individuals without a diagnosis of scleroderma, M = 77.74, SD = 20.24, lower levels of Self-Kindness (M = 13.64, SD = 4.80) than those without a diagnosis of scleroderma, M = 15.65, SD = 4.32, and lower Mindfulness, (M = 13.84, SD = 2.86) than individuals without a diagnosis of Scleroderma, M = 12.74, SD = 3.35.

A Mann Whitney U Test was also conducted to address the first hypothesis as the variable Over-identification (SCS) was negatively skewed in the Community group and normally distributed in the Scleroderma sample; the variable Reactive Hyper-arousal was positively skewed in the Scleroderma sample and normally distributed in the Community sample. Attempts to use the same transformations to achieve normality for each of these variables was unsuccessful. Analysis revealed significant differences in levels of Over-identification for individuals without a diagnosis of Scleroderma (Md = 13.0, n = 58) and individuals diagnosed with Scleroderma (Md = 16.0, n = 80), U=1542.50, z = -3.37, p = .001, r = -0.29. The Scleroderma group recorded a higher median score on Over-identification than the Community group. Reactive Hyper-arousal however failed to reach significance.

The results indicated that individuals with Scleroderma have fewer experiences of EMWS, less self-compassion (lower mindfulness and self-kindness and greater over-identification) than those not diagnosed with Scleroderma.

Scleroderma – Community: Depression, Anxiety and Stress

Preliminary assumption testing was also conducted to check for normality, linearity, univariant and multivariant outliers, homogeneity of variance, covariance matrices and multicollinarity for the Anxiety, Depression and Stress subscales of the DASS. Analysis revealed the Anxiety and Depression subscales were negatively skewed. Examination of plots revealed univariate and multivariate outliers for the DASS subscales; two cases were removed as recommended by Tabachnick and Fidell (2007). The skewness was reduced with removal of outliers; however not sufficiently as data remained skewed. Inverse transformations were conducted for these variables resulting in more acceptable skews closer to zero, meeting the assumptions for normality. Attempts to use the same transformations to achieve normality for Stress, Depression and Anxiety (logarithm transformations for the Scleroderma Sample and normally distributed variable Stress, and Inverse transformed variables Depression and Anxiety for the Community sample) were unsuccessful.

Therefore a Mann Whitney U Test was conducted to compare Depression, Anxiety and Stress in the Community and Scleroderma samples to investigate the second hypothesis; that individuals diagnosed with Scleroderma would report higher levels of Anxiety, Depression and Stress than participants without a diagnosis of Scleroderma.

Depression: Results revealed significant differences in levels of depression in individuals without a diagnosis of Scleroderma (Md = 8.0, n = 63), when compared with individuals with Scleroderma (Md = 10.0, n = 92), U = 2105.0, z = - 2.92, p = .003, r = - 0.24.

Anxiety: Results revealed significant medium differences in Anxiety levels for individuals without a diagnosis of Scleroderma (Md = 8.0, n = 63), when compared with individuals diagnosed with Scleroderma (Md = 10.0, n = 93), U = 1671.5, z = - 4.60, p = .000, r = - 0.37.

Results demonstrated that the Scleroderma group recorded a higher median score for Depression and Anxiety than the Community group; however the scores for Stress failed to reach significance. These results indicated that individuals diagnosed with Scleroderma experienced higher levels of Anxiety and Depression than those without a diagnosis of Scleroderma. Results for Stress levels were not significantly different. Therefore the results support two of the three comparisons for the second hypothesis.

Comparison Study: Community and Scleroderma Groups (Diffuse, Limited)

Depression, Anxiety and Stress: DASS scores revealed higher levels of Depression and Anxiety in the Diffuse (more rapid symptom onset than limited sclerosis) and Limited sclerosis groups when compared with the Community sample. The Community group reported a greater percentage of scores within the normal range for all three variables (Depression, Anxiety and Stress) when compared to the Scleroderma groups. Some individuals diagnosed with Diffuse and Limited sclerosis reported severe levels of Depression and Anxiety; scores not indicated by the Community sample. Results for clinical scores (measured by the DASS) suggested individuals diagnosed with Diffuse and Limited Sclerosis experienced more severe levels of Depression and Anxiety than individuals from the Community without this diagnosis. The Community group reported a greater percentage of scores within the normal range for all three variables (Depression, Anxiety and Stress) when compared to the Scleroderma groups. Some individuals diagnosed with Diffuse and Limited sclerosis reported severe levels of Depression and Anxiety; scores not indicated by the Community sample. Results for clinical scores (measured by the DASS21) suggested individuals diagnosed with Diffuse and Limited Sclerosis experienced more severe levels of Depression and Anxiety than individuals from the Community without this diagnosis. Results for clinical scores are presented in Table 14.

Table 14

Depression Anxiety & Stress for the Community, Diffuse and Limited sclerosis groups

Variable		No Sclero	Limited Sclerosis	Diffuse Sclerosis
Depression				
0-9	Normal	61.9%	40.0%	45.5%
10-13	Mild	28.6%	42.0%	27.2%
14-20	Moderate	9.5%	10.0%	15.2%
21-27	Severe		8.0%	12.1%
Anxiety				
0-7	Normal	36.5%	22.0%	11.8%
8-9	Mild	34.9%	22.0%	23.5%
10-14	Moderate	28.6%	38.0%	50.0%
15-19	Severe		16.0%	14.7%
20+	Ex Severe		2.0%	
Stress				
0-14	Normal	90.5%	75.5%	79.4%
15-18	Mild	7.9%	12.3%	14.7%
19-25	Moderate	1.6%	12.2%	5.9%
26-11	Severe			

As clinical scores do not provide significance levels further statistical analysis was conducted (Kruskal Wallis Test: non-parametric due to skewed variables) to support the hypothesis that individual's diagnosed with Scleroderma would report greater experiences of Depression, Anxiety and Stress when compared with Community participants.

A Kruskal-Wallis Test was conducted to investigate the third hypothesis: higher levels of Anxiety, Depression and Stress would be found between the Diffuse sclerosis group when compared with the Community group and the Limited sclerosis group when compared with the Community group. Mean Rank for Anxiety in the Community group was reported at 55.56 (63), diffuse 92.82, (34) and the limited group, 84.44 (50), χ^2, 22.06, 2*df*, p=.000. Depression in the Community group, 61.89 (63), diffuse 78.95 (33), and limited group, 84.53 (50), χ^2, 8.89, 2*df*, p =.012.

Results indicated that significant differences occurred between groups, in that significantly higher levels of Depression and Anxiety were reported by Diffuse and Limited Sclerosis participants when compared to Community participants.

Anxiety: The Diffuse group recorded a higher median score (*Md* = 10.5) on Anxiety than the Limited group (*Md* = 10.0) with both Scleroderma groups reporting significantly higher levels of Anxiety than the Community group (*Md* = 8.0).

Depression: The Limited group reported higher levels of Depression (*Md* = 10.5) than the Diffused group (*Md* =10.0), with both Scleroderma groups recording significantly higher levels of Depression than the Community group (*Md* = 8).

Results indicated that both the Limited and Diffuse groups had higher levels of Anxiety and Depression than the Community groups. However the Limited group reported higher levels of Depression than the Diffuse group with the Diffuse group reporting higher levels of Anxiety than the Limited group. Therefore both scleroderma groups differed significantly from the Community group, partially supporting the third hypothesis.

Hyper-arousal and Low Self-Compassion (Over-identification): A Kruskal-Wallis Test was conducted to investigate part of the fourth hypothesis as Hyper-arousal and Over-identification were skewed. The hypothesis was that individuals diagnosed with Diffuse and Limited Sclerosis would report lower levels of Self-Compassion, Emotion Regulation, EMWS, an Insecure Attachment Style and higher levels of Hyper-arousal when compared with Community participants without a diagnosis of Scleroderma. Mean Rank for Reactive Hyper-arousal for the Community group was 60.59 (58), Diffuse 81.48 (31), Limited 63.66 (43), χ^2, 6.46, 2*df*, p=.039. Mean Rank for Over-identification for the Community group was 53.31 (58), Diffuse 79.39 (31), Limited 73.64 (42), χ^2, 12.14, 2*df*, p=.002.

Hyper-arousal: The Diffuse group recorded a higher median score (*Md* = 8.0) on Hyper-arousal (Reactive) than the Community group, (*Md* = 6.0) with the Limited group reporting the same median score as the Community group (*Md* = 6.0).

Low Self-compassion: The Diffuse group recorded a higher median score (*Md* = 16.0) on Over-identification than the Community group (*Md* = 13.0) while the Limited group also reported a higher median score than the Community group for over-identification and similar scores to the Diffuse sclerosis group (*Md* = 15.5).

The results demonstrated that the Diffuse group reported significantly higher levels of Hyper-arousal and Over-identification than the Community and Limited groups with the Limited group reporting similar levels of Hyper-arousal when compared to the Community group and slightly lower levels of Over-identification than the Diffuse group. Comparison results for groups (mean rank) are presented below in Table 15.

Table 15

Scleroderma Diffuse/Limited Sclerosis and Community Samples Non-Parametric Statistics

Significant Variables	*N*	Mean Rank
Anxiety		
Community Group	63	55.56
Limited Sclerosis	50	84.44
Diffuse Sclerosis	34	92.82
Depression		
Community Group	63	61.89
Limited Sclerosis	50	84.53
Diffuse Sclerosis	33	78.94
Reactive Hyper-arousal		
Community Group	58	60.59
Limited Sclerosis	43	63.66
Diffuse Sclerosis	31	81.48
Over-identification		
Community Group	58	53.31
Limited Sclerosis	42	73.64
Diffuse Sclerosis	31	79.39

T-tests and MANOVA were conducted to investigate the remainder of the fourth hypothesis: that lower Self-compassion, EMWS, insecure Attachment and higher Suppression would be reported by the Diffuse group when compared to the Community group and the Limited sclerosis group when compared with the Community group. T-Tests revealed significant mean differences between the Diffuse/Limited and Community groups.

EMWS: Individuals with Diffuse reported experiencing lower EMWS (*M* = 66.77, *SD*

= 27.24) than the no scleroderma group; *M* = 78.65, *SD* = 20.22, *t* (92) = 2.18, *p* = .034, the magnitude of the mean difference = .85, 95% CI: 2.01 to 21.75 (eta Squared =.05).

Self-Compassion: Lower Self-Kindness (SCS), (*M* = 12.42, *SD* = 3.97) was found for the Limited group when compared to the No Scleroderma group; *M* = 15.81, *SD* = 4.46; *t* (99) = 3.96, *p* = .000, the magnitude of the mean difference = .85, 95% CI: 1.69 to 5.09 (eta Squared = .16). Lower Mindfulness (SC), (*M* = 12.00, SD = 3.09, was found for the Limited group when compared to the No Scleroderma group; *M* = 13.95, *SD* = 2.95; *t* (99) = 3.22, *p* = .002, mean difference = .85, 95% CI: 0.75 to 3.15 (eta squared = .10).

Re-appraisal: A greater ability for Re-appraisal was found for the No Scleroderma group; *M* = 30.31, *SD* = 6.08 when compared to the Limited group *M* = 27.56, *SD* = 7.25; *t* (99) = 3.22, *p* = .002, mean difference = .85, 95% CI: 0.75 to 3.15 (eta squared = .01).

A one way between groups MANOVA was performed. Violations were evident for Box's Test of Equality of Covariance Matrices, significant at .004. EMWS was significant at .010 on Levene's test of equality of error variance and removed from analysis. Once removed Box's Test of Equality of Covariance Matrices was no longer significant, however Self-Kindness was significant at .030 on Levene's test of equality of error variance. Therefore an alpha level of .025 was set (as suggested by Tabachinick & Fidell, 2007). Results revealed a significant difference between individuals diagnosed with Diffuse and Limited sclerosis and those from the Community sample without this diagnosis on the combined dependent variables (Wilks' Lambda $F(2,130) = 3.03$, $p = .007$). When the results for the dependent variables were considered separately, Self-Kindness, $F(1, 131) = 7.25$, $p = .001$, partial eta = .10 (10.1% of the variance) and Mindfulness, $F(1, 131) = 6.44$, $p = .002$, partial eta = .09 (9.1% of the variance) were statistically significant. Re-appraisal failed to reach significance. Inspection of mean scores indicated that individuals diagnosed with Limited sclerosis reported significantly lower levels of Self-Kindness (*M* = 12.42, *SD* = 3.97), when compared

with community individuals without this diagnosis *M* = 15.81, *SD* = 4.46, while the Diffuse sclerosis group reported lower levels of Self-Kindness (*M* = 15.35, *SD* = 5.59) than individuals without scleroderma and higher levels of Self- Kindness than the Limited group. Means and standard deviations are presented in Table 16.

Table 16

Scleroderma - Diffuse & Limited Sclerosis - Community - Means and Standard Deviations

Variables	N	M	SD
EMWS			
Non-Scleroderma Group	62	78.64	20.22
Scleroderma Group	88	70.03	23.94
Limited Sclerosis	47	72.72	21.74
Diffuse Sclerosis	32	66.76	27.23
Self-Kindness			
No Scleroderma Group	57	15.65	4.32
Scleroderma Group	78	13.65	4.80
Limited Sclerosis	43	12.42	3.97
Diffuse Sclerosis	31	15.35	5.59
Mindfulness			
No Scleroderma Group	57	13.95	2.95
Scleroderma Group	78	12.80	3.39
Limited Sclerosis	43	12.00	3.12
Diffuse Sclerosis	31	14.29	3.50

Mean scores also revealed that individuals diagnosed with Limited sclerosis reported significantly lower levels of Mindfulness (*M* = 12.00, *SD* = 3.09), than those without this diagnosis (*M* = 13.95, *SD* = 2.95) while the Diffuse sclerosis group reported slightly higher

levels of Mindfulness (M = 14.29, SD = 3.50) than individuals without this diagnosis; and higher levels of Mindfulness than the Limited group. Results also presented in Table 16 demonstrate that individuals diagnosed with Limited sclerosis reported significantly lower levels of Self-Kindness and Mindfulness when compared with the Community group. The Diffuse group reported significantly higher levels of Over-identification than the Community group and similar (non-significant) levels of Self-Kindness and Mindfulness when compared with this group. Means and standard deviations for EMWS are also shown in Table 16.

Results for Hypotheses: First Hypothesis; Psychosocial – Scleroderma/Community

Results partially supported the first hypothesis: that lower levels of Self-Compassion, Emotion Regulation EMWS, and an Insecure Attachment Style and higher levels of Hyper-arousal would be reported by the Scleroderma group when compared with the non-Scleroderma group. Results indicated that individuals diagnosed with Scleroderma have fewer early experiences of warmth and safety (EMWS) and treat themselves with less Self-Kindness than individuals who have not been diagnosed with Scleroderma. Results also indicated that individuals with Scleroderma reported lower levels of Mindfulness and greater levels of Over-identification than those without Scleroderma, partially supporting the first hypothesis.

Results for the Second and Third Hypotheses: Mental Health

Results partially supported the second hypothesis: that individuals diagnosed with Scleroderma would report higher levels of Anxiety, Depression and Stress when compared with individuals from the Community sample without a diagnosis of Scleroderma. Results indicated that individuals diagnosed with Scleroderma reported higher levels of Anxiety and Depression (DASS) than individuals without a diagnosis of Scleroderma; furthermore results to address hypothesis three; higher levels of Anxiety, Depression and Stress would be found between the Diffuse sclerosis group when compared with the Community group and the

Limited sclerosis group when compared with the Community group were partially supported. Findings demonstrated that both the Limited and Diffuse groups had significantly higher levels of Anxiety and Depression than the Community groups, however the Limited group reported higher levels of Depression than the Diffuse group and the Diffuse group reported higher levels of Anxiety than the Limited group.

Results for the Fourth Hypothesis: Psychosocial – Diffuse/Limited/Community

The fourth hypothesis compared the Scleroderma groups (Diffuse and Limited sclerosis) independently with the Community group; Lower levels of Self-compassion, EMWS, an insecure Attachment style and higher levels of Suppression and Hyper-arousal would be reported by the Diffuse sclerosis group when compared with the Community group and the Limited sclerosis group when compared with the Community group. Results indicated that individuals diagnosed with Limited sclerosis reported significantly lower levels of Self-Kindness and Mindfulness when compared with the Community group. The Limited group reported similar levels of Hyper-arousal to the Community group. While the Diffuse group reported significantly higher levels of Hyper-arousal (Reactive) and Lower Self-Compassion (Over-identification) than the Community group and similar levels of Self-Kindness and Mindfulness to the Community group.

Summary of Results

Results indicated that individuals diagnosed with Scleroderma had fewer early experiences of warmth and safety (EMWS) and utilized emotion regulation strategies that reflect lower Self-Compassion (Self-Kindness, Mindfulness and Over-Identification) and higher levels of Anxiety and Depression than individuals without Scleroderma. Significant differences were identified between the Limited and Diffuse groups and the Community group. Individuals with Limited sclerosis reported lower levels of Self-Kindness, Mindfulness, Anxiety and Depression when compared with the Community group and similar

levels of Hyper-arousal when compared to the Community group. The Diffuse group reported similar levels of Self-Kindness and Mindfulness and significantly higher levels of Hyper-arousal, Over-identification, Anxiety and Depression than the Community group.

Figure 2 provides a visual representation of the differences between individual's diagnosed with scleroderma (more negative experiences) and those without this illness (more positive experiences) for early life experiences, levels of self-compassion and mental health.

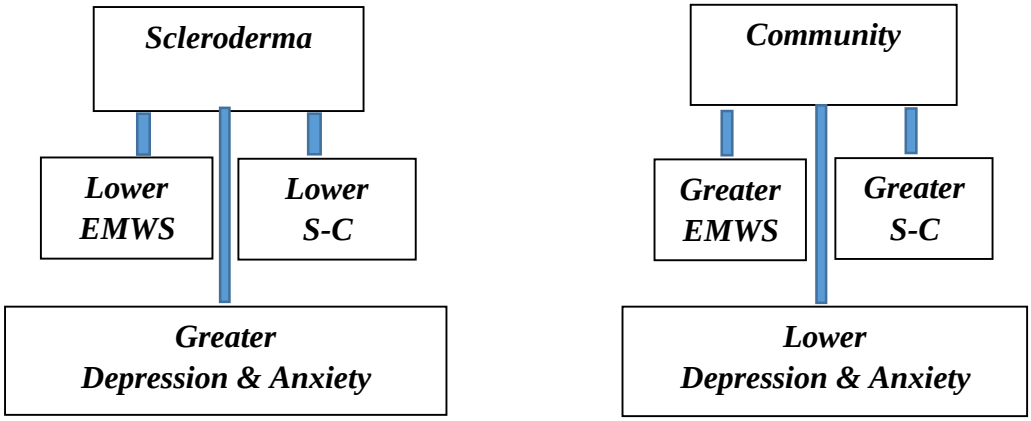

Figure 2: Scleroderma – Community Model: Differences between Groups

Discussion

Differences between Groups for EMWS, Self-Compassion, Anxiety and Depression

Findings partially supported hypothesis one and two and indicated that individuals diagnosed with scleroderma had fewer experiences of warmth and safety than individuals from the general community. Individuals diagnosed with scleroderma were also less likely to use self-compassion strategies of self-kindness and mindfulness, more likely to over-identify with their experiences and report higher levels of anxiety and depression than individuals without scleroderma. The findings suggest that early life stress and the limited use of self-compassion strategies may impact on an individual's autoimmune response and development

of scleroderma. Findings relating to depression and anxiety further support and add to the literature that suggests that a large percentage of individuals with scleroderma experience elevated levels of depression (e.g., Thombs et al., 2007; Beretta et al., 2006; Angelopoulos et al., 2001; Roca et al., 1996). When compared with depression in community populations (e.g., Pignone et al., 2002), individuals with scleroderma experienced more depression and also more anxiety (Legendre et al., 2005) than community individuals (APA, 2013).

Although these studies investigated prevalence rates separately and did not make comparisons between illness groups and the general population, percentages were considerably higher in scleroderma samples than community samples. The second study's findings, that individuals with scleroderma experience more depression and anxiety than community participants without a diagnosis of scleroderma, therefore contributes to the literature by directly comparing these two groups. Depression and anxiety are conditions associated with immune alterations (e.g., Miller, 2005) and in the first study were predicted by low self-compassion. Depression resulting from stress may trigger hyperactivity of the HPA-axis that impacts on immune system functioning (e.g., Kiecolt-Glaser & Glaser, 2002) and scleroderma symptomology. Engaging in self-compassion strategies may reduce arousal levels involved in the flight and fight response thereby decreasing the risk of an autoimmune response. Elevated levels of depression and anxiety may also reflect more negative, less compassionate cognitions and emotions when attempting to manage stressful situations.

The findings support the earlier study in this series that suggests psychosocial experiences linked to scleroderma symptoms and earlier onset are likely to involve the fight and flight response and immune activation and may partly explain why individuals reporting a limited ability to provide self-compassion strategies, experienced elevated scleroderma symptoms.

Differences between Limited and Diffuse Sclerosis and Community Groups

Differences were identified between the limited and diffuse sclerosis and community groups. Limited systemic sclerosis affects 60% of individuals diagnosed with scleroderma. This form is the most common type of scleroderma and is also known as limited cutaneous disease or CREST syndrome (calcinosas, Raynaud's phenomenon, esophagal dysmolity, scleradactal and telangiectasias) and also involves skin thickening of the extremities. Diffuse systemic sclerosis is present in 35% of individuals diagnosed with scleroderma and involves a more rapid onset, symptoms include swelling of the hands and legs, carpal tunnel arthritis, Raynaud's phenomenon and fatigue and generally more severe skin thickening than limited sclerosis. The extent of skin thickening and pace of disease progression differentiates diffuse scleroderma from limited scleroderma. Both diffuse and limited scleroderma subsets have similar gastrointestinal disease and interstitial lung fibrosis symptoms (Bolster & Silver, 2008).

Differences between the group's psychosocial experiences were investigated in relation to a sample from a normal population (without scleroderma) to determine whether different psychosocial experiences such as levels of warmth and safety in early life and emotion regulation strategies such as self-compassion were lower for those with an illness (scleroderma) than those without scleroderma. The findings that lower self-kindness and mindfulness and elevated anxiety and depression were experienced by individuals diagnosed with limited sclerosis when compared with the community group, partially supported hypothesis three and four. The diffuse sclerosis group reported similar levels of self-compassion (self-kindness and mindfulness) to the community group and significantly higher levels of hyper-arousal (reactive), lower self-compassion (over-identification), anxiety and depression than the community group; findings that also partially supported hypothesis three and four. These findings suggest that the diffuse group were more likely to engage in self-

compassion strategies that involve self-kindness and mindful awareness. However, these individuals tended to over-identify with their situation, a strategy that may increase their experiences of anxiety and depression and levels of reactive hyper-arousal and subsequently their immune reactions.

Lower levels of self-kindness and mindfulness (for the limited group when compared with community participants) may develop from early life experiences low in warmth and safety (reported by the limited group with greater scleroderma severity in the first study). The inability to engage in self-compassion strategies of mindfulness and self-kindness may result from limited experiential exposure to compassionate others (that provide nurturing and feelings of safeness) and limited early learning experiences that may assist in the development of self-compassionate behaviours (such as self-kindness). These early life experiences may influence cognitive and emotional processes involved in an individual's (with limited sclerosis) ability to self-sooth and physiological processes involved in the development of scleroderma symptoms. These results support the findings in the first study that demonstrated limited early life experiences of warmth and safety and insecure attachment styles predicted severity of some scleroderma symptoms (such as pain) and depression, anxiety and stress in the limited sclerosis group. The reporting of elevated depression at the time of the study by scleroderma participants in relation to community participants may influence these participants recall of early rearing experiences as more negative than those reporting less depression and may partly be a reason for the more negative reporting on the EMWS scale from scleroderma participants; although these depressive symptoms may also be bidirectional in that the EMWS experiences may also have generated negative or depressive views of early life.

Differences between reported experiences of self-compassion and hyper-arousal for the diffuse and limited groups, when compared with the community group, suggests that different cognitive, emotional and physiological process may be involved in how these

individuals respond to situations and how these responses may affect immune functioning. It may be possible that individuals with diffuse sclerosis may have a greater predisposition to heightened levels of arousal and elevated levels of anxiety (may also be a result of the disease process) that may influence the functioning of the immune system. These participants also tended to over-identify with their experiences (low self-compassion a strategy that may also increase arousal) that may include their experiences of scleroderma due to the severity of their condition. These experiences (anxiety and over-identification) may elevate already heightened physiological responses (reactive hyper-arousal) that could result in a heightened immune response associated with autoimmunity.

Individuals diagnosed with limited sclerosis were more likely to experience more severe depression than the diffuse and community groups. This may reflect early life stress and the development of limited internal resources to cope with managing emotional and physical stress (such as low self-compassion), when compared with individuals diagnosed with diffuse sclerosis who generally suffer more severe symptom and engage in greater self-compassion strategies (mindfulness and self-kindness) than the limited sclerosis participants.

These findings may reflect the different experiences and strategies for managing stress and possible predispositions to an augmented autoimmune response. It may be possible to suggest that individuals diagnosed with diffuse sclerosis (the more severe type of scleroderma) are more likely to have a predisposition to hyper-arousal and anxiety and although appear to employ positive self-compassion strategies (at similar levels to community participants) they tend to engage in strategies that involve over-identifying with their experiences, that may also increase levels of arousal and impact on the immune system and scleroderma symptoms. Whereas limited sclerosis participant's scleroderma symptoms may be influenced by social and emotional experiences found in the first study. Early life stress and avoidant relational styles involving fearful and dismissive attachment that may have

resulted in the development of inadequate emotion regulation strategies lacking in self-compassion and limited in self-soothing may be linked to the threat response. These experiences (perhaps learnt in early childhood) may have become the normal way of responding to stress and as a consequence engaged the fight and flight system over long periods (chronic) of time, eventually initiating an autoimmune reaction.

This suggestion is further supported by the findings supporting the hypothesis that scleroderma participants reporting lower levels of early life experiences of warmth and safety were also likely to report a diagnosis of Raynaud's when compared to individuals with scleroderma without a diagnosis of Raynaud's; the first symptom of scleroderma that can be diagnosed up to decades before the onset of limited sclerosis (Smith & Kahaleh, 2008). Raynaud's phenomenon; however, is generally diagnosed immediately before or at the time of receiving a diagnosis of diffuse sclerosis (Smith & Kahaleh, 2008). Early life stress and the resulting ineffective emotional and cognitive strategies for managing stress may therefore influence the onset of Raynaud's and the development of scleroderma in individuals with limited sclerosis. Stress may also effect the development of Raynaud's in the diffuse sclerosis group. However, as different antibodies are involved in the two major subsets of this disease and the onset and severity is significantly more rapid in the diffuse group, it is suggested that a greater predisposition to diffuse sclerosis and greater experiences of stress in individuals diagnosed with limited sclerosis may explain the differences in predictor variables for each of the groups.

Limitations

Reporting of early memories of warmth and safeness required the recall of past experiences. Recounting these events may be impeded (under-reported or over-reported) by individual's ability to accurately report experiences that may have occurred at a much earlier time in the participant's lifespan. The reporting of these early life experiences may also have

been influenced by memory bias as elevated levels of depression were reported by the scleroderma sample when compared to the community sample, which may have resulted in more negative reporting on the EMWS scale. However in support of using this information, the reporting of low self-compassion and an insecure attachment styles by scleroderma participants was related to a number of negative psychological and physiological variables in the first study, which suggests this reporting may be reliable. The small sample size for the limited and diffuse groups is also a limitation although fewer analysis were conducted in this study compared with study one. Assumptions for a few analyses were violated therefore these results should be viewed with caution (although correlations showed significant relationships between variables), however overall the results from the second study supported the findings in the first study.

Conclusion

These findings provide further support for research findings in the first study, which suggested a limited capacity to reduce arousal may contribute to the development of scleroderma; in that early life stress and limited opportunities to develop the self-soothing social mentality and related emotion regulation strategies such as self-compassion, may contribute to the development of scleroderma. Community participants showed a greater capacity to utilize self-soothing strategies (such as self-compassion) to reduce emotional and physical arousal, strategies that may have developed as a result of greater experiences of warmth and safety as a child, when compared to scleroderma participants. Self-compassion strategies may calm arousal levels when the threat response is engaged, reducing immune reactions that may impact on an individual's health.

Community participants also reported lower experiences of depression and anxiety, which are conditions associated with immune alterations (e.g., Miller, 2005) and low self-compassion (Neff et al., 2007). Scleroderma participant's limited capacity to use self-compassionate cognitions (that were higher in the community sample) that may have developed

from a deficit in early life experiences of warmth and safety, when experiencing distress or stressful events, may impact on their psychological and physiological health and contribute to the earlier development and/or exacerbation of scleroderma symptoms.

Implications

Findings suggest, a limited capacity to engage self-compassionate emotion regulation strategies when managing stress or distress, may reduce the capacity of an individual to return the body to a pre-stress state within a short time-frame, increasing vascular, inflammatory and immune related responses, and the risk of immune dysfunction. In terms of clinical applications it may be beneficial for therapists to evaluate individuals levels of self-compassion (e.g., using the Self-Compassion Scale: Neff, 2003b) and the levels of warmth and safety experienced as a child (e.g., EMWS Scale: Gilbert and colleagues, 2009) and provide education around how these experiences may be impacting on scleroderma symptomology. These measures used in this study may assist in the understanding of the client's capacity to provide self-compassion and inform psychological treatment and preventative treatments for physiological health, particularly individuals with family histories involving immune conditions such as autoimmune diseases like scleroderma. Further research in the form of comparison studies on other autoimmune diseases may also provide similar outcomes for these populations and require investigation. Outcomes from this type of research may also inform therapeutic treatments to aid in the reduction of negative arousal inflammatory responses and symptomology of other autoimmune diseases.

CHAPTER FIVE: STUDY THREE – SCLERODERMA & BREAST CANCER

Comparison Study between Scleroderma and Breast Cancer Groups

The findings from the first study on scleroderma suggest that early negative rearing experiences and emotional and cognitive approaches such as low self-compassion and suppression, coping strategies likely to create a chronic state of hyper-arousal and the

engagement of the threat system, were likely to predict a range of scleroderma symptoms and psychopathology such as depression and anxiety. The second study supported the findings from the first study, in that significant results suggested, individuals diagnosed with scleroderma experienced fewer positive early life experiences and greater psychosocial stress than community individuals. These results supported the focus of the third study 3(a): that explored whether similar biopsychosocial experiences were also likely to occur in individuals diagnosed with another severe illness (breast cancer). That is, whether negative early childhood experiences were as likely to occur in breast cancer participants (when compared with those diagnosed with scleroderma) and if so, whether the resulting emotional and cognitive outcomes were also experienced. Study 3(b) involved comparative analysis to determine differences between all groups involved in the three studies; Scleroderma, Breast Cancer and Community groups.

Review of the Literature: Cancer and Psychosocial Stress

Researchers suggest stress is associated with dysregulation of the immune system and is linked to other immune related diseases (that do not involve autoimmunity). Cancer related diseases unlike autoimmune diseases (that involves a hyper-responsive immune system) that attack healthy tissue (Smith & Kalhaleh, 2008) are associated with immune suppression (Whiteside, 2006). Biopsychosocial cancer studies have found associations between stress and individuals diagnosed with cancer. Research suggests an association with neuroendocrine-immune changes, psychosocial stress and an increased risk of cancer (Sephton & Spiegel, 2003). Scleroderma researchers have not previously compared differences in stressors in individuals with different immune responsive diseases such as cancer. The current study therefore investigated differences in the type of stressors experienced and/or strategies used to regulate emotions; in diseases that involve different immune responses (scleroderma: hyper-responsive and breast cancer: suppressed) and whether these experiences were linked to onset

and increased symptomology of the respective diseases.

Different processes are involved in the development of autoimmunity and cancer, although managing exposure to stressors appears to play a part in both diseases. Individuals diagnosed with cancer demonstrated a disruption in a number of responses including rhythms of cortisol, melatonin (Blask et al., 2005), prolactin, temperature, circulating proteins and cell cycles. Cancer patients with advanced disease symptoms demonstrate higher levels of circadian disruption (Mormont & Levi, 1997), a condition associated with stress (Sephton & Spiegel, 2003). Stress experiences are also linked to cancer. The adverse childhood experiences (ACE) study a large scale research project was conducted in the USA to assess the relationship between adverse early life experiences and health conditions in adulthood. This study found that there was a higher risk of developing cancer with exposure to four or more stress/trauma events (Dube et al., 2009).

Cancer is the main cause of illness in Australia and in 2012 it was anticipated that approximately120,000 Australians would receive a cancer diagnosis, with over 50% of this disease expected to be diagnosed in males with prostrate and bowel cancers. Breast cancer was expected to be the most commonly occurring cancer in females in 2012. The number of new cancer cases has risen significantly from 1991 (approximately 66,000) to 2009 (approximately 114,000) and is reported as partly due to an increase in population and an aging population. In 2010 approximately 43,000 Australians died from cancer; this statistic is exceeded only by cardiovascular disease. Five year survival rates for all cancers has increase by 19% from 1982-1987 (47%) to 2006-2010 (66%), although this increase is not consistent across all cancers. Higher incidence and mortality rates of all cancers are experienced by Indigenous Australians and those with lower socioeconomic status; therefore higher incidence and mortality was associated with decreased levels of socioeconomic status (Australian Institute of Health and Welfare, 2013).

Breast Cancer

Breast cancer is a complex heterogeneous disease and includes pathological features such as hormone-receptor profile and tumours that are categorised into distinct groups (Mavaddat, Antoniou, Easton, & Garcia-Closas, 2010). The breast is primarily an excretory gland that functions to produce milk as nourishment for a baby. The female breast consists of terminal duct lobular units that are grouped into larger units called lobes. These units consist of specialised interlobular connective tissue, interlobular collecting ducts and terminal ductules. The lobules are surrounded by dense connective tissue and fat. The female breasts may vary considerably in size during the life span; older postmenopausal women's breast progressively become atrophic, and by age 80, the majority (80%) of the breast tissue consists of fat cells surrounded by thickened connective tissue. Breasts contain lymphatics that drain into the parasternal; and the majority (75%) into the axilla; the axillary location of metastases (cancer cells) in women who develop breast cancer. Some breast cancers express hormone receptors; blocking the oestrogen receptors on cancer cells may reduce tumour growth (Australian Government, Cancer Australia, 2012). Breast cancer is one of the most common forms of cancer that develops in women; it also occurs in men, however it is much rarer (1: 100 carcinomas are diagnosed in men when compared with women). Breast cancer was selected as a comparison study as both scleroderma and breast cancer are disease that are more prevalent in women than men.

The age a woman is affected by breast cancer influences the type of breast disease experienced. Generally post pubertal girls and young women experience fibroadenomas, which are benign tumours of the breast. Fibrocystic breast disease occurs in middle aged women and breast cancer is more prevalent in older women. Approximately 50% of all breast masses are not cancerous; benign lesions, such as fibrocystic disease and fibroadenoma, account for half of breast masses that undergo biopsy, with the remaining 50% found to be malignant. Fibrocystic

change involves three features; fibrosis, cysts and epithelial proliferation. This disease involves ductual budding, crowding of ductals, and capillary projections called papillomatosis. Larger papillomas may appear and extend into the lumen of the larger ducts. Papillomatosis and atypical intraductal are premalignant changes that may occur in the breasts of some women. These atypical intraductal or lobular lesions may develop into invasive carcinoma over a number of years in some women; however, approximately 80% of women will not develop breast cancer (Australian Government, Cancer Australia, 2012).

Some breast cancers are non-invasive and are therefore confined to a specific area. This type of cancer includes ductal carcinoma in situ and is confined to the ducts of the breast. Lobular carcinoma in situ is also a non-invasive breast cancer that is confined to the lobules of the breast. Invasive breast cancers are another form that may spread to other areas. Early breast cancer is an invasive cancer that is contained in the breast and may or may not spread to lymph nodes in the breast or armpit. Some cancer cells may extend outside the breast and into the armpit area but cannot be detected. Locally advanced breast cancer is an invasive breast cancer that has spread to areas near the breast, such as the chest wall. Secondary breast cancer (also called metastatic or advanced breast cancer) is an invasive breast cancer that has spread from the breast to other parts of the body.

There are also rarer types of invasive breast cancer; Paget's disease of the nipple is a rare form of invasive breast cancer that affects the nipple and the area around the nipple. Inflammatory breast cancer is also a rare form of invasive breast cancer that affects the blood vessels in the skin of the breast, causing the breast to become red and inflamed (Australian Government, Cancer Australia, 2012). As age is a factor in breast cancer diagnosis, age of breast cancer onset was also explored in this study to determine whether psychosocial stress was linked to an earlier onset of breast cancer. Differences between variables and age of onset of disease symptoms for breast cancer and scleroderma were also explored.

Stages and Categories of Breast Cancer

There are a number of stages of breast cancer. Stage 0 is regarded as pre-invasive' breast cancer that includes ductal carcinoma in situ and lobular carcinoma in situ; Stage I and Stage II, describe early breast cancer; Stage IIB and III are used to classify advanced breast cancer and Stage IV describes advanced breast cancer (locally advanced breast cancer or secondary breast cancer). Breast cancer is also divided into three categories. Breast cancer cells that are found in one to three lymph nodes in the armpit are classed as category one. Category two describes breast cancer cells in four to nine lymph nodes in the armpit, and lymph nodes that are enlarged, and/or attached to each other or to nearby tissue; or one or more lymph nodes under the breastbone. Breast cancer cells that are found in 10 or more lymph nodes in the armpit or one or more lymph nodes above or below the collarbone or breast cancer cells that are found in one or more lymph nodes under the breastbone and in one or more lymph nodes in the armpit describe the features of category three (Australian Government, Cancer Australia, 2012).

Incidence of Breast Cancer: Breast cancer accounted for approximately 27% of new cancers in women and except for non-melanoma skin cancer was the most common cancer in Australian women in 2009, with over 13,000 new cases reported in women and 110 in men during this period. The risk of developing breast cancer increases with age with the average age recorded in 2009 at approximately 61 years; with around 77% of women diagnosed with breast cancer in 2009 aged over 50 years, with a risk (for women) of developing breast cancer before the age of 85 years, at one in eight in Australia (Australian Institute of Health and Welfare, 2013). In 2010, breast cancer accounted for 15% of cancer deaths in women and was the second highest cause of cancer-related deaths in women (2,840 women and 24 men).

The incidence of breast cancer is rising and it is predicted that by 2020 over 17,000 new cases will be diagnosed in Australian women; however five-year relative survival rates are also increasing from 72% (1982–1987) to 89.4% (2006–2010). Five-year relative survival rates for

breast cancer were higher relative to tumour size with greater survival rates for smaller tumours (98% 0–10 mm, 95% 11–15 mm, 93%16–19 mm, 88% 20–29 mm and 73% for women with tumours 30 mm or greater (AIHW, 2013). There are a number of genetic and non-genetic risk factors associated with the development of breast cancer, such as the role of oestrogens, and high family prevalence of breast cancer that tends to reflect a clustering in families. Non genetic factors include alcohol intake, body mass index, and physical activity; these aspects may be shared within families but are likely to contribute moderately to genetic familial risk (Mavaddat et al., 2010). Genetic factors were also identified in a study that involved genotyping of over 10,000 breast cancer participants and more than 9,000 controls from five countries; findings demonstrated a higher prevalence of the CHEK2 gene 1100delC amongst first-degree relatives diagnosed with breast cancer and a higher odds ratio of breast cancer occurring at younger ages (Eeles, Peto, & Stratton, 2004).

Therefore it is possible genetic factors may play a greater part in the development of breast cancer (than scleroderma) with stress perhaps impacting on genetic predispositions. Whereas for scleroderma a low prevalence rate of developing scleroderma within families was reported (with the absolute risk at less than 1%; Arnett et al., 2001). This Indicates genetic factors combined with other factors including those linked to psychosocial stress may have a greater influence on the development of scleroderma. The involvement of stress may be greater in scleroderma than breast cancer. Therefore the current study explored these two diseases and psychosocial variables to determine differences between internal and external stressors and onset and exacerbation of disease symptoms.

Breast Cancer and Psychosocial Stressors

A number of studies have identified a relationship between breast cancer and insecure attachment styles. A study by Tacon and colleagues (2001) demonstrated that individual's with breast cancer reported significantly higher incidences of insecure histories and early loss and

significantly higher scores on avoidant attachment when compared to those without breast cancer (Tacon et al, 2001). Research also found that breast cancer patients who reported a fearful avoidant attachment style, attended fewer mammograms screenings than those breast cancer participants with other styles of attachment (Tuck & Consedine, 2015).

A number of studies have also reported associations between stress and trauma in individuals diagnosed with breast cancer. A study conducted into adverse childhood experiences (ACEs) found a possible relationship between multiple adverse childhood experiences reported by 62% of participants and cancer diagnosis which was reported by 10% of participants (Brown, Thacker & Cohen, 2013). While a similar study on childhood adversity found that emotional, physical, and sexual abuse were associated with breast cancer-related intrusive symptoms (Goldsmith et al., 2010). In a study by Palesh and colleagues (2007) approximately 42% of female participants reported experiencing one or more traumatic events. A comparison study was conducted between these women and female participants who reported no traumatic or stressful life event in relation to disease-free intervals. Results demonstrated that significantly longer disease-free intervals occurred amongst participants with no stress or trauma events, when compared to those who had experienced one or more stressful events, with those reporting one or more traumatic life events experiencing the shortest disease-free interval. Results indicated a link between stressful or traumatic experiences and more rapid breast cancer progression, and the possibility that stressful or trauma events may reduce the capacity of the individual's immune system to resist tumour growth. However a study by Spiegel and colleagues found no relationship between metastatic breast cancer and stress experiences. Progression and irregularities in daytime cortisol levels in this study were found in two thirds of a sample of 104 female participants with metastatic breast cancer. Flatter daytime cortisol slopes in this sample predicted earlier mortality. However no significant relationship was found between daytime cortisol slope and social stress, or an elevated HPA response to stimuli

(Spiegel, Giese-Davis, Taylor, & Kraemer, 2006).

A comparison study by Abercrombie et al., (2004) also found that women with metastatic breast cancer had flatter cortisol slopes than women without this disease. Breast cancer participants with greater disease severity demonstrated higher cortisol levels, and flatter diurnal cortisol rhythms, however no relationship was found between cortisol slope and psychological factors. When compared with controls flatter rhythms were related to higher perceived stress, suggesting differences between women diagnosed with breast cancer and those without this disease with regard to stress related correlates and cortisol diurnal slope. Flatter cortisol levels were associated with a number of responses that include hyper-responsiveness to stimulation resulting from either corticotrophin releasing factor (CRF) or acute stress, however in some studies these levels appear to be affected by factors unrelated to stress or psychological functioning in breast cancer individuals .

Research therefore suggests that stress and trauma can significantly impact on an individual's immune system and may result in the development of disease. However the chemicals involved in the stress response in breast cancer may not always be related to psychosocial factors. There are a number of known genetic, gender and physiological risk factors associated with breast cancer, such as having a family history of breast cancer, being female, oestrogens and age of onset (Eeles et al., 2004; Mavaddat et al., 2010), as well as personal stress experiences (Palesh et al., 2007). As stress experiences are involved in the mechanisms associated with immune responses and autoimmune diseases, it is possible that different psychosocial variables as well as physiological factors may be associated with these two diseases. Therefore the examination of difference and similarities in variables that are related to stress and disease were explored in the current study in relation to scleroderma and breast cancer; to determine the degree psychosocial stress influences onset and exacerbation of the respective diseases. Also investigated were more positive ways of relating to self through

investigation of self-compassion and suppression of emotions; to determine whether difference occurred between illness groups for positive and negative interpersonal relating and the influence these experiences may have on disease symptoms and age of onset.

Suppression and Self Compassion: Previous research has investigated emotional suppression and self-compassion techniques in breast cancer patients (Iwamitsu et al., 2005; Przezdziceki et al., 2013). Iwamitsu and colleagues (2005) found that breast cancer patients who engaged in emotional suppression had elevated levels of anxiety, depression, anger and psychological distress, when compared to individuals without breast cancer. Research suggests that suppression of emotional experiences may result in distorted cognitions and are a risk for developing psychological conditions (Hayes et al., 1996) such as anxiety, depression (Gross & John, 2003; Iwamitsu et al., 2005), an insecure attachment style, (Mikulincer & Shaver, 2007) and physiological conditions such as immune dysfunction (Petrie et al., 1998; Schore, 1994) and pain (Burns et al., 2006; Thomas et al., 2006). Whereas research revealed that self-compassion was found to be a protective factor for psychological distress in women experiencing body changes resulting from breast cancer treatment (Przezdziceki et al., 2013). These variables were further investigated in relation to breast cancer symptoms to determine whether differences occur between the two illness groups (breast cancer and scleroderma) in the management of their intra-personal relationship and the connection between these variables and disease onset and symptomology.

Scleroderma and Breast Cancer Precipitatory Factors

Although genetic factors appear to be involved in the development of both scleroderma and breast cancer, external factors that invoke a stress response and impact on immune functioning may differ between individuals diagnosed with these two diseases. There appears to be a link between genetic factors (that influence inflammation, collagen, vascular and immune functioning) involved in the development of scleroderma and stress chemicals (that also involve

similar physiological responses; e.g. Crittenden & Claussen, 2000; Every & Lating, 2002; Miller, 2005; Schore, 1994; Van der Kolk & Greenberg, 1987). Whereas for breast cancer the link between genetic factors and psychosocial stress appears to be less apparent, with the stress chemical cortisol (a major contributor to the development of breast cancer) found in a number of studies not to be related to psychological factors (e.g., Abercrombie et al., 2004). Research also suggests that differences occur in the stress response for individuals with scleroderma and breast cancer (in separate studies) when compared to individuals without these diseases (Abercrombie et al., 2004; Freedman & Ianni, 1983). To investigate the hypotheses differences between the scleroderma and breast cancer groups were explored in relation to psychosocial aspects and levels of pain experienced by both groups. Differences between groups were also explored in relation to psychosocial aspects with the postulation that the breast cancer group would have lower negative psychosocial experiences than the scleroderma group (greater predisposition to the disease, rather than stress related). That is whether the reported childhood experiences and the subsequent negative ways of relating to self and others were more likely to have influenced the experience of scleroderma when compared with the experience of individuals diagnosed with breast cancer. The literature suggests individuals with breast cancer experience depression and anxiety at lower rates than individuals with scleroderma (Thombs et al., 2007; Beretta et al., 2006; Angelopoulos et al., 2001; Roca et al., 1996; Legendre et al, 2005); although, these studies did not involve direct comparisons. For example Khan and colleagues found that 22% of participants experienced depression and 19% reported anxiety and stress associated with breast cancer (Khan, Amatya, Pallant, & Rajapaksa, 2012). Research by Vardanima, Omidvari and Montazer (2010), found that 82% of participants who had undergone a mastectomy experienced a decrease in anxiety and depression symptoms over time, however, 38% of participants continued to experience severe anxiety and 22% reported severe levels of depression, at 18 month follow-up. Hill and colleagues found that 40% of

breast cancer participants reporting anxiety, had a previous episode of anxiety prior to a diagnosis of breast cancer and 66% of those reporting depression had experienced a reoccurrence of depression after receiving a diagnosis of breast cancer. This research suggests that a significant number of individuals diagnosed with breast cancer have experienced depression and/or anxiety (Hill et al., 2011); however at lower rates than individuals with scleroderma where studies reported between 33% and 65% of individuals with depression (e.g., Beretta et al., 2006).

The third study therefore investigated whether individuals with scleroderma have greater clinical scores for depression and anxiety than breast cancer and community participants and whether these experiences can be predicted by negative rearing experiences and emotion regulation strategies associated with the threat mentality. In addition this study explored whether individuals who engaged in emotion regulation strategies high in self-compassion experienced more favourable psychological and physiological health outcomes. These aspects are outlined in the following hypotheses.

Hypotheses: Study 3(a)

The hypotheses were divided into three headings. Hypothesis 1: Comparison study between scleroderma and breast cancer groups for psychosocial variables that predict mental health. Hypotheses 2-3: Comparison study between scleroderma symptoms and breast cancer symptoms of pain and psychosocial and mental health variables. Breast cancer symptoms and psychosocial and mental health variables. Hypothesis 4: Age diagnosed with scleroderma and age diagnosed with breast cancer and psychosocial variables.

Hypothesis One: Comparison Study: Scleroderma/Breast Cancer-Mental Health

1(a): Individuals diagnosed with Scleroderma and Breast Cancer reporting elevated levels of Depression, Anxiety, Stress and Disease Symptoms would experience lower Early Memories of Warmth and Safety, Self-Compassion, an Insecure Attachment Style

(Dismissive/Fearful), greater Suppression, Hyper-arousal and Disease symptoms.

1(b): Furthermore these experiences would differ between illness groups.

Hypotheses 2-3: Scleroderma and Breast Cancer – Psychosocial/Mental Health/Physical

Hypothesis Two: Scleroderma & Breast Cancer - Pain

2(a): Lower levels of Self-Compassion, Emotion Regulation, EMWS, and Insecure Attachment and higher levels of Hyper-arousal would predict greater levels of pain in both illness (Scleroderma/Breast Cancer) groups.

2(b): Furthermore individuals with Scleroderma and Breast Cancer would experience differences in psychosocial variables that predict Pain.

Hypothesis Three: Breast Cancer - Biopsychosocial & Mental Health

3(a): Lower levels of Self-Compassion, Emotion Regulation, EMWS, and an Insecure Attachment Style and higher levels of Hyper-arousal would predict higher levels of Fatigue and Nausea in the Breast Cancer group.

3(b): Furthermore higher levels of Depression, Anxiety and Stress would predict greater levels of Nausea and Fatigue in individuals diagnosed with Breast Cancer.

Hypothesis Four: Age Diagnosed with Illness – Psychosocial Variables

4(a): Differences would occur between the predictor variables for Age diagnosed with Breast Cancer and Age diagnosed with Scleroderma.

4(b): Furthermore lower EMWS and Self-compassion and higher levels of insecure attachment, Hyper-arousal and Suppression would predict being diagnosed with an illness (Scleroderma or Breast Cancer) at a younger age; conversely lower Hyper-arousal, insecure attachment and Suppression and higher EMWS and Self-compassion would predict illness diagnosis at an older age.

Method

Procedure

Several breast cancer organisations and support groups reaching an international population were contacted to determine interest in promoting this study to members diagnosed with breast cancer. A number of organisations reported some concern about exploring early rearing experiences of members diagnosed with breast cancer, due to the fear members would blame themselves or their family for their disease. This concern was raised by a number of breast cancer organisations, as the gate keepers of these organisations felt it was in the best interest of their members to restrict information about the study. This situation reduced the opportunity to collect a larger sample for the study. Organisations that agreed to participate in this study were the Breast Cancer Care Organisation from Western Australia and the West End Advanced Breast Cancer Group in Queensland. These non-profit organisations provide support and education for their members. Approval was received from these organisation's committees once the survey and explanatory letter had been sighted and discussed.

Information explaining the purpose of the study was placed on the Western Australian Breast Cancer Care's websites notice board and included a link to the online survey posted on the Bond University research website.

Information about the study was also displayed on a poster on the notice board at the Advanced Breast Cancer Support Group in Brisbane informing potential participants about the study along with information about the web address to access the survey. A notice was also posted on the Research Participation Notice board of the Psychology Department within the Humanities and Social Science Faculty, informing potential participants about the research.

A written explanatory letter containing information about the purpose, procedure, where questions/complaints could be directed, risks and benefits of the research project and

anonymity of participants was attached as a cover page to the questionnaire for participants to view prior to completing the survey. Completion of the survey required approximately 30-40 minutes of the participant's time. This project was approved by the Bond University Human Research Ethics Committee.

Participants

Males and female adults aged 18 years and over who have been diagnosed with breast cancer, were invited to participate in this research project. Thirty-one individuals diagnosed with breast cancer from breast cancer organisations and staff and students from Bond University completed the online survey.

Measures

The measures were the same as those included in studies one and two with the exclusion of the Scleroderma Health Assessment Questionnaire (except for the pain scale: adapted for breast cancer) and the inclusion of questions related to nausea, fatigue and breast cancer related information such as category, stage and type of breast cancer (examples include, ductal carcinoma in situ, early breast cancer, and inflammatory breast cancer).

Results

Study Three: Overview of Analyses

Analysis was performed using SPSS version 20, Cronbach's alpha revealed the coefficients for the variables, Depression, EMWS, Dismissive and Fearful Attachment were above .90, the variables, Stress, Self- Kindness and Hyper-arousal, were above .80; Self-Compassion Mindfulness, and Over-identification, were above .79, Suppression was above .75 and Anxiety was above .70. Results demonstrated the variables to be reliable, with good to satisfactory internal consistency.

Descriptive statistics for each of the continuous variables was conducted to determine

means, standard deviations and sample size. Frequencies for demographic information such as age and education and health information, such as age diagnosed with breast cancer and type of breast cancer were also investigated.

Age: Frequencies for current age were reported at between 37 and 76 years with a mean age of 54; for age diagnosed with breast cancer, the age range for participants was between 36 and 69 years, mean age was 50.

Participants: Frequencies for participants revealed a total of 31 subjects, 28 females and one male with two participants failing to complete this information.

Education: One participant reported gaining a primary school education, seven participants, reported achieving a secondary education, 16 participants reported attaining a tertiary education and five participants indicated post graduate qualifications, two participants did not supply this information.

Health: Frequencies for breast cancer related health information, revealed four participants were diagnosed with Ductal carcinoma in situ (DCIS); 17 reported a diagnosis of early breast cancer (EBC), one participant reported inflammatory breast cancer (IBC), nine individuals did not complete this information. A Comparison study between the different types of breast cancer and psychosocial variables was part of the initial study; however, due to insufficient participant responding to health questions, analysis was not conducted.

Missing data was evident, the pattern appeared random for all completed scales. A large number of participants had completed demographic, health and breast cancer information. However approximately 30% did not complete the psychological scales. Thirty one individuals participated in the study; with the exclusion of cases to meet assumptions and hypothesis criteria a total of 22 participants remained. Low participation rates are evident in cancer studies. Research suggests that the number of breast cancer participants prepared to engage in research studies is between 1.2% and 11% of available participants (Habersack &

Luschin, 2013). As similar studies (e.g., Habersack & Luschin, 2013; that compared 12 breast cancer participants with 10 non-breast cancer participants on psychosocial variables) have had similar difficulties with gaining numbers we proceeded with the study.

Results: Hypotheses

Hypothesis One: Scleroderma and Breast Cancer - Mental Health

Scleroderma/Breast Cancer – Depression, Anxiety and Stress

The Scleroderma (total sample) and Breast Cancer data files were merged. Data was screened for suitability to enter into multiple regression analysis. The assumptions for normality were met for Early Memories of Warmth and Safeness (EMWS) Suppression and Reappraisal subscales of the ERQ, Hyper-arousal, the Self-compassion scale and subscales (Self-kindness, Mindfulness, Common humanity, Self- judgment and Isolation) were normally distributed. The Self-compassion subscale Over-identification, Fear subscale of the RQ, Pain scale of the SHAQ, Anxiety, Depression and Stress, subscales of the DASS21 were positively skewed, examination of plots revealed no univariate or multivariate outliers. Square-root, logarithm and inverse transformations were conducted according to the shape of the distribution for each of the variables reducing the skew to within acceptable range.

Scleroderma/Breast Cancer – Depression: A split file conducted to address hypothesis 1(a/b) for the Breast Cancer and Scleroderma groups produced warnings (that not all data could be computed) when multiple regression analysis was conducted, (possibly due to the number of variables that were not significant for both groups and the small sample size in relation to the number of variables) therefore the data was divided into the two respective groups (using only those variables significant to each of the groups) and analysis conducted independently.

Scleroderma: Results for the Scleroderma group revealed meaningful relationships between the dependent variable Depression and psychosocial variables, EMWS (r = -.37),

p = .000 Fearful attachment (r = .36), p = .001, Dismissive attachment (r = .28), p = .000, Suppression (r = .26), p = .019, and Self-compassion (r = -.37), p = .001. These variables were entered into multiple regression analysis. Results for the Scleroderma group demonstrated the variables significantly accounted for 54.0% (Adjusted R^2 = 24.2%) of the variance, F (5, 72) = 5.92, p = .000, in Depression. The regression coefficients demonstrated that EMWS (β = - .24, p = .035, sr^2 = .05%) and Self-compassion (β = - .24, p = .030, sr^2 = .05%; power was calculated at 1.0) were significant unique predictors of Depression experienced by individuals diagnosed with Scleroderma.

Breast Cancer: Pearson's bivariate correlations revealed meaningful relationships for the Breast Cancer group between the dependent variable Depression and psychosocial variables, Dismissive attachment (r = .56), p = .007 and Self-compassion (r = -.51), p = .014. These significant variables were entered into a multiple regression analysis. Results for the Breast cancer group demonstrated the variables significantly accounted for 66.7% (Adjusted R^2 = 38.6%) of the variance, F(2, 19) = 7.04, p = .004, in Depression. The regression coefficients demonstrated that Self-compassion (β = -.39, p = .040, sr^2 = .14%) and an insecure Dismissive attachment style (β = .47, p = .015, sr^2 = .21%; power was calculated at .99) significantly predicted Depression experienced by individuals diagnosed with Breast Cancer.

Conclusion - Results Hypotheses 1(a/b) - Depression: Results for hypothesis 1(a) indicated that lower levels of Self-compassion and a greater tendency to engage in a Dismissive style of relating predicted Depression in individuals diagnosed with Breast Cancer; whereas, lower early life experiences of warmth and safety and lower Self-compassion predicted Depression in individuals diagnosed with Scleroderma. Results demonstrated similarities in the predictor variable Self-compassion for both illness groups; however, differences in predictor variables were also found for the Scleroderma and Breast Cancer groups. EMWS predicted Depression

in the Scleroderma group; whereas Dismissive attachment predicted Depression in the Breast Cancer group. Results indicated some differences between illness groups for predictor variables for Depression and therefore provided partial support for hypothesis 1(b).

Scleroderma/Breast Cancer – Hypothesis 1(a/b) for Anxiety: A split file was conducted to address hypotheses 1(a/b): with regard to psychosocial variables that predict anxiety; and difference between predictor variables for psychosocial and physiological symptoms for Breast Cancer and Scleroderma groups for Anxiety.

Scleroderma: The results for the Scleroderma sample demonstrated the variables significantly accounted for 66.6% (Adjusted R^2 = 41.3%) of the variance, $F(4, 71) = 14.18$, $p = .000$, in Anxiety in individuals diagnosed with Scleroderma. The regression coefficients demonstrated that Pain ($\beta = -.26$, $p = .007$, $sr^2 = .06\%$), EMWS ($\beta = .27$, $p = .008$, $sr^2 = .06\%$ Suppression ($\beta = .34$, $p = .000$, $sr^2 = .11\%$ and Hyper-arousal ($\beta = .28$, $p = .004$, $sr^2 = .07\%$; power was calculated at 1.0) were significant unique predictors of Anxiety in individuals diagnosed with Scleroderma. Indicating that early life experiences (limited EMWS) and high utilization of Suppression (an inadequate emotion regulation strategy) and physiological symptoms of Hyper-arousal and Pain were involved in heightened levels of Anxiety in individuals diagnosed with Scleroderma; partially supporting hypothesis 1(a).

Breast Cancer: When comparing the results (split file) for predictor variables for Anxiety in the Breast Cancer group; the variables accounted for 61.5% (Adjusted R^2 = 23.2%) of the variance, $F(4, 17) = 2.59$, $p = .074$, in Anxiety in individuals diagnosed with Breast cancer. Although the model was not significant, the regression coefficients demonstrated that Suppression ($\beta = .53$, $p = .028$, $sr^2 = .21\%$; power was calculated at .95) was a significant unique predictor of Anxiety experienced by individuals diagnosed with Breast Cancer. To determine whether the model for Anxiety was significant, the Breast Cancer sample was analysed independently of the Scleroderma sample. Significant

correlation coefficients for the Breast Cancer sample revealed meaningful relationships between Anxiety and Pain (r = .43), p = .046 and Suppression (r = .52), p = .012. These variables were entered into a multiple regression analysis to determine whether the model with the significant variables unique to the Breast Cancer group, made a greater significant contribution than the split file (for the total illness sample; Scleroderma and Breast Cancer) analysis for the Breast Cancer group. The results for the Breast Cancer sample demonstrated the variables significantly accounted for 55.7% (Adjusted R^2 = 23.8%) of the variance, $F(2, 19) = 4.28$, p = .029, in Anxiety in individuals diagnosed with Breast cancer. The regression coefficients demonstrated that Suppression (β = .47, p = .037, sr^2 = .18%; power was calculated at .99) was the only significant variable in the Breast Cancer group; partially supporting hypothesis 1(a).

Conclusion - Results Hypotheses 1(a/b): Anxiety

Results demonstrated that both the Scleroderma and Breast Cancer models were significant and that Suppression was the only predictor variable for Anxiety for both groups; and the only variable that predicted Anxiety for the Breast Cancer group. Whereas early life experiences low in warmth and safety, greater use of Suppression and elevated levels of Hyper-arousal and Pain were all involved in heightened levels of Anxiety in individuals diagnosed with Scleroderma, partially supporting hypothesis 1(a). Therefore differences and similarities exist between the two groups (Scleroderma and Breast Cancer) as to what predicts Anxiety, providing partial support for hypotheses 1(b).

Scleroderma/Breast Cancer – Hypothesis 1(a/b) for Stress: A split file for the illness groups (Breast Cancer/Scleroderma) produced warnings when multiple regression analysis was conducted, therefore the data was divided into the two respective groups and analysis conducted independently.

Scleroderma: Results for the Scleroderma group revealed meaningful relationships

between the dependent variable Stress and psychosocial variables, EMWS (r = - .35), p = .001, Hyper-arousal (r = .50), p = .000, Fearful attachment (r = .23), p = .033, and Self-Compassion (r = -.44), p = .000. Significant variables were entered into multiple regression analysis. Results for the Scleroderma group demonstrated the variables significantly accounted for 57.7% (Adjusted R^2 = 29.6%) of the variance, F (4, 71) = 8.87, p = .000, in Stress. The regression coefficients demonstrated that Hyper-arousal (β = .35, p = .002, sr^2 = .09%) and Self-compassion (β = -.24, p = .036, sr^2 = -.04%; power was calculated at .99) significantly predicted Stress experienced by individuals diagnosed with Scleroderma.

Results demonstrate that elevated levels of Hyper-arousal and low experiences of Self-compassion predicted higher levels of Stress in individuals diagnosed with Scleroderma partially supporting hypothesis 1(a).

Breast Cancer: Pearson's bivariate correlations revealed meaningful relationships for the Breast Cancer group between the dependent variable Stress and psychosocial variables. Correlation coefficients demonstrated associations between the dependant variable, Stress and Dismissive attachment (r = .45), p = .034, Self-compassion (r = - .56), p = .007 and Hyper-arousal (r = .61), p = .003. These variables were entered into a multiple regression analysis to determine the hypothesis 1(a). The results for the Breast Cancer sample demonstrated the variables significantly accounted for 71.7% (Adjusted R^2 = 43.4%) of the variance, F(3, 18) = 6.36, p = .004, (power was calculated at .99) in Stress in individuals with Breast Cancer. However the regression coefficients demonstrated that no variable was a significant unique predictor of Stress experienced by individuals diagnosed with Breast Cancer. Therefore this part of hypothesis 1(a) was not supported.

Conclusion - Results Hypotheses 1(a/b): Stress

Results indicated that a number of variables were significantly associated with Stress in both illness groups, however only Hyper-arousal and Self-compassion predicted Stress in

the Scleroderma group providing partial support for hypothesis 1(a). No variable predicted Stress in the Breast Cancer group. Results demonstrated that differences occurred between the two groups for variables that predicted Stress; partially supporting hypothesis 1(b).

Results for Different Predictor Variables: Depression, Anxiety and Stress

Results for predictor variables for mental health partially supported hypothesis 1(b) by demonstrating that differences occurred between the groups (although some variables were similar predictors of Depression and Anxiety). Lower Self-compassion and a greater Dismissive attachment style predicted Depression in Breast Cancer participants, whereas lower Self-compassion and limited EMWS predicted Depression in individuals diagnosed with Scleroderma. Results for Anxiety also demonstrated similarities and difference between groups for predictor variables with Suppression significant for both groups and the only variable that predicted Anxiety for the Breast Cancer group. Whereas scleroderma participants experienced a number of other psychosocial variables including suppression that were related to anxiety (Lower EMWS, higher levels of emotional suppression and elevated pain and hyper-arousal), Differences occurred between groups for Stress; with Hyper-arousal and Self-compassion predicting Stress in the Scleroderma group and no variable predicting Stress in the Breast Cancer group. Results demonstrated that some similarities were evident for Depression (lower Self-compassion) and Anxiety (higher Suppression); however, differences did occur between the two groups (Scleroderma/Breast Cancer) for variables that predicted Mental Health (Depression, Anxiety and Stress); thereby findings provide partial support for hypothesis 1(b).

Conclusion of Results: Hypotheses One

Some similarities were evident for predictor variables for Depression (lower Self-compassion) and Anxiety (higher Suppression) for Scleroderma/Breast Cancer groups; however, differences also occurred between the two groups for variables that predicted

Mental Health (Depression, Anxiety). Difference between variables that predicted Depression were EMWS (Scleroderma) and Dismissive attachment (Breast Cancer) and for Anxiety, EMWS, Hyper-arousal and Pain (Scleroderma), no variable was significant for Breast Cancer. For Stress, Hyper-arousal and Self-Compassion were significant for Scleroderma; however, no variable was significant for Stress and Breast Cancer. Results demonstrated differences between groups for variables that predict Depression and Anxiety; partially supporting hypothesis one.

Results for Hypothesis Two: Difference in Predictor Variables for Pain

Pain and Psychosocial Variables: Hypotheses: 2(a) Lower levels of Self-Compassion, Emotion Regulation, EMWS, and an Insecure Attachment Style and higher levels of Hyper-arousal would predict higher levels of Pain in both illness groups. 2(b): Furthermore individuals with Scleroderma and Breast Cancer (split file) would experience differences in psychosocial variables that predict Pain.

Pearson's bivariate correlations were conducted after the assumptions for multiple regression were met; correlation coefficients demonstrated meaningful relationships between the dependent variable, Pain and psychosocial variables, EMWS, ($r = -.24$), $p = .009$, and Dismissive attachment ($r = .23$), $p = .018$. Multiple regression analysis was conducted to determine the relationship and unique contribution of the predictor variables with the dependent variable Pain. The results for the total sample demonstrated the variables significantly accounted for 3.2% (Adjusted $R^2 = 0.8\%$) of the variance, $F(2, 104) = 5.72$, $= .004$, in Pain associated with disease symptoms.

The regression coefficients demonstrated that Dismissive attachment ($\beta = .20$, $p = .041$, $sr^2 = .04\%$, and EMWS ($\beta = -.22$, $p = .021$, $sr^2 = -.02\%$; power was calculated at .44; Soper, 2013) were significant unique predictors of Pain experienced by individuals diagnosed with both Breast Cancer and Scleroderma (illness group). Therefore early life

experiences and insecure attachment predicted elevated pain in the total illness group; partially supporting the second hypothesis.

Scleroderma: A split file was conducted for Pain and the total illness groups, to explore the Scleroderma and Breast Cancer groups and psychosocial variables EMWS and Dismissive attachment to determine hypothesis 2(b). Multiple regression analysis demonstrated the variables significantly accounted for 41.0% (Adjusted R^2 = 14.8%) of the variance, $F(2, 82) = 8.30$, $p = .001$, in Pain associated with disease symptoms. The regression coefficients demonstrated that EMWS ($\beta = -.29$, $p = .006$, $sr^2 = -.08\%$) and a Dismissive attachment style ($\beta = .24$, $p = .021$, $sr^2 = .06\%$; (power was calculated at .99) significantly predicted Pain experienced by individuals diagnosed with Scleroderma.

Breast Cancer: Multiple regression analysis for Breast Cancer participants demonstrated the variables significantly accounted for 3.2% (Adjusted R^2 = -10.4%) of the variance, $F(2, 19) = 0.10$, $p = .990$, in Pain associated with disease symptoms. The regression coefficients demonstrated that neither EMWS ($\beta = -.004$, $p = .985$, $sr^2 = -.00\%$) nor Dismissive attachment ($\beta = .03$, $p = .891$, $sr^2 = .00\%$; (power was calculated at .09) were significant for Pain for Breast Cancer participants.

Conclusion - Hypothesis Two

Results demonstrated that the total illness model was weaker than the Scleroderma model. The independent variables (EMWS and Dismissive attachment) for the illness model demonstrated a lower contribution to Pain than the Scleroderma model, indicating a difference between groups for predictor variables for Pain. Results therefore partially supported the second hypothesis in that early life experiences low in Warmth and Safety and an insecure Dismissive attachment style predicted greater experiences of Pain related to disease symptoms in Scleroderma participants. These factors (EMWS and Dismissive attachment); however, did not predict Pain for individuals diagnosed with Breast Cancer.

Therefore differences occurred between groups for what predicted pain in the Scleroderma and Breast Cancer groups and provide partial support for hypothesis two.

Hypothesis Three: Breast Cancer Symptoms and Psychosocial/Mental Health

Hypothesis 3(a) - Psychosocial: Pearson's bivariate correlations were conducted after the assumptions for multiple regression were met to address hypothesis three: Lower levels of Self-compassion, Emotion Regulation, EMWS, and an Insecure Attachment style and higher levels of Hyper-arousal would predict higher levels of Nausea and Fatigue in Breast Cancer participants.

Nausea: Correlation coefficients revealed meaningful relationships between the dependent variable Nausea and psychosocial variables Dismissive attachment *(r* = .46), p = .030, and Fearful attachment (r = .46), p = .031; these variables were entered into multiple regression analysis. Results for the Breast Cancer group demonstrated the variables significantly accounted for 53.5% (Adjusted R^2 = 21.1%) of the variance, $F(2, 19) = 3.81$, p = .041, (power was calculated at .97) in Nausea related to Breast Cancer. Although the model was significant, the regression coefficients demonstrated that neither variable was a significant unique predictor of Nausea experienced by individuals diagnosed with Breast Cancer.

Fatigue: Pearson's bivariate correlations also revealed meaningful relationships between the dependent variable Fatigue and psychosocial variables, Hyper arousal *(r* = .53), p = .013, and Fearful attachment (r = .48), p = .029; these variables were entered into a multiple regression analysis. Results for the Breast Cancer group demonstrated the variables significantly accounted for 62.6% (Adjusted R^2 = 32.4%) of the variance, $F(2, 18) = 5.80$, p = .011, in Fatigue associated with Breast cancer. The regression coefficients demonstrated that Hyper-arousal (β = .14, p = .040, sr^2 = .17%; power was calculated at .99) was a significant unique predictor of Fatigue experienced by individuals diagnosed with Breast

cancer.

Conclusion: Hypothesis 3(a): Psychosocial

Results demonstrated that the disease variables (Nausea/Fatigue) were significantly related to an insecure attachment style (Fearful or Dismissive); however the only variable that significantly predicted disease related symptoms (Fatigue) was hyper-arousal. Findings demonstrated partial support for hypothesis 3(a) in that individuals reporting elevated levels of Fatigue experience higher levels of hyper-arousal. A comparison for differences between groups for psychosocial variables that predicted disease variables demonstrated that a number of disease variables were related to scleroderma symptoms; however this was not so for breast cancer. The results may be due to the small sample size and the inability to complete analysis on a number of disease related variables such as specific types of breast cancer experienced. Future research that involves a greater sample size may provide further insight into whether there is a relationship between types of breast cancer and the psychosocial variables investigated in the current study. This research would then demonstrate whether differences occur between disease symptoms and the relationship with psychosocial variables and may inform biopsychosocial treatment for each individual disease.

Results - Hypothesis 3(b): Breast Cancer Symptoms and Mental Health

Results for hypothesis 3(b): that higher levels of Depression, Anxiety and Stress would predict higher levels of Nausea and Fatigue in Breast Cancer participants demonstrated significant results for Depression.

Depression: Bivariate correlations revealed meaningful relationships between the dependent variable Depression and disease symptoms Nausea, (r = .44), p = .043, and Fatigue, (r =.62), p = .003. These variables were entered into a multiple regression analysis to determine hypothesis 5(b). Results for the Breast Cancer sample demonstrated the variables significantly accounted for 61.6% (Adjusted R^2 = 31.0%) of the variance, $F(2, 18) = 5.50$,

p = .014, in Depression in individuals diagnosed with Breast Cancer. The regression coefficients demonstrated that Fatigue (β = .61, p = .033, sr^2 = .18%; power was calculated at .99) was the only disease symptom that was a significant unique predictor of Depression experienced by individuals diagnosed with Breast Cancer; indicating that elevated levels of Fatigue predicted higher levels of Depression in individuals with Breast Cancer. No variables were significantly related to Anxiety.

Stress: Correlation coefficients also revealed meaningful relationships between the dependent variable Stress and disease symptoms Nausea, (r = .60), p = .003, and Fatigue, (r =.58), p = .006, for the Breast Cancer sample. These variables were entered into multiple regression analysis to determine the hypothesis. Results for the Breast Cancer sample demonstrated the variables significantly accounted for 63.7% (Adjusted R^2 = 34.0%) of the variance, $F(2, 18) = 6.14$, p = .009, in Stress for individuals diagnosed with Breast Cancer. The regression coefficients demonstrated that neither Fatigue nor Nausea significantly predicted Stress in individuals diagnosed with Breast Cancer. Results demonstrated that fatigue was the only variable to predict mental health symptoms of depression in Breast Cancer participants.

Conclusion- Hypothesis Three

Results demonstrated that fatigue was the only significant variable for Breast Cancer participants. Psychosocial variable Hyper-arousal and the Mental Health variable Depression significantly predicted Fatigue in individuals diagnosed with Breast Cancer. Therefore elevated levels of Hyper-arousal and greater experiences of Depression created heightened Fatigue experiences for Breast Cancer participants. Findings that partially supported the third hypotheses.

Conclusion Summary - Hypotheses 2-3: Comparison: Scleroderma/Breast Cancer

Results partially supported the second and third hypotheses in that differences

occurred between illness groups for psychosocial variables that predicted Pain; for Scleroderma, EMWS and Dismissive attachment predicted pain and for Breast Cancer, no variable predicted Pain related to disease symptoms. Results for Breast Cancer related symptoms other than Pain, demonstrated that psychosocial and mental health variables predicted fatigue (Hyper-arousal and Depression). Findings demonstrated that psychosocial and mental health variables predicted breast cancer related symptom of fatigue and that differences occurred between groups for psychosocial variables that predicted pain.

Results – Hypothesis Four: Age Diagnosed with Illness (Scleroderma/Breast Cancer)

Illness group: Pearson bivariate correlations were conducted to determine hypothesis 4(a): that more negative psychosocial experiences would predict an earlier onset of illness. Results revealed meaningful relationships between the dependent variable, Age diagnosed with illness (Breast Cancer or Scleroderma) and Self-compassion (r = .22), p = .029, Stress (r = -.25), p = .029, and Hyper-arousal (r = .30), p = .003. These variables were entered into a multiple regression analysis to determine the fourth hypothesis. The results for the total illness group demonstrated the variables significantly accounted for 32.7% (Adjusted R^2 = 8.0%) of the variance, $F(3, 91) = 3.62$, p = .016, (power was calculated at .98) in Age diagnosed with an illness. The regression coefficients demonstrated that that no variable significantly predicted Age diagnosed with an illness (scleroderma or breast cancer).

A split file was conducted to determine hypothesis 4(b) differences between the illness groups for Age diagnosed with either Scleroderma or Breast Cancer and psychosocial variables. Multiple regression analysis was conducted to determine the relationship and unique contribution of predictor variables with dependent variables.

Scleroderma: The results for the total Scleroderma group (diffuse/limited/other forms) demonstrated the variables significantly accounted for 35.2 (Adjusted R^2 = 8.6%) of the variance, F (3, 70) = 3.29, p = .025, in Age diagnosed with scleroderma. The regression

coefficients demonstrated that Hyper-arousal (β = - .31, p = .023, sr^2 = .10%; power was calculated at .99) was a significant unique predictor of Age diagnosed with scleroderma.

Breast Cancer: The results for the Breast Cancer sample demonstrated the variables significantly accounted for 67.4 (Adjusted R^2 = 35.8%) of the variance, F (3, 17) = 4.71, p = .014, in Age diagnosed with Breast Cancer. The regression coefficients demonstrated that Self-compassion (β = .61, p = .013, sr^2 = .25%; power was calculated at .99) accounted for a large percentage of the variance (25%) and was a significant unique predictor of Age diagnosed with breast cancer.

Conclusion- Hypothesis Four

Results supported hypothesis four by demonstrating differences in predictor variables for Age diagnosed with scleroderma and Age diagnosed with breast cancer; with higher levels of Self-compassion predicting a diagnosis of Breast Cancer at an older Age (conversely lower Self-compassion predicted a diagnosis of Breast Cancer at a younger Age). Whereas higher levels of Hyper-arousal predicted a diagnosis of scleroderma at a younger Age (conversely lower Hyper-arousal predicted a diagnosis of Scleroderma at an older Age). Demonstrating that levels of hyper-arousal for Scleroderma participants and levels of Self-compassion for Breast Cancer participants are involved in the earlier or later development of the respective diseases. These results partially supported the fourth hypothesis.

Predictor Variables - Self-Compassion & Hyper-arousal

Predictor variables for Age diagnosed with Scleroderma (Hyper-arousal) and Age diagnosed with Breast Cancer (Self-compassion), although not part of the original hypotheses were explored to determine whether early life experiences low in warmth and safety also contributed to levels of arousal (as well as levels of self-compassion and age diagnosed with the respective diseases) and whether these experiences differed between groups.

Scleroderma- Hyper-arousal: Pearson's bivariate correlations demonstrated

significant relationships between Hyper-arousal and Self-compassion (r = - .43, p = .000), Age diagnosed (r = .35, p = .002) and EMWS (r = - .31, p = .006). Multiple regression analysis for the Scleroderma group demonstrated the variables significantly accounted for 54.9 (Adjusted R^2 = 27.1%) of the variance, F (3, 70) = 10.04, p = .000, in Hyper-arousal. The regression coefficients demonstrated that Self-compassion (β = -.30, p = .007, sr^2 = .09%), Age diagnosed with scleroderma (β = -.30, p = .004, sr^2 = .09%) and EMWS (β = -.22, p = .046, sr^2 = .05%; power was calculated at .99) significantly predicted Hyper-arousal in individuals diagnosed with Scleroderma.

Breast Cancer- Self-compassion: Pearson's bivariate correlations demonstrated significant relationships between Self-compassion and Hyper-arousal (r = - .49, p = .020) and Age diagnosed (r = .60, p = .004). Results demonstrated that the variables Hyper-arousal and Age diagnosed with Breast Cancer significantly accounted for 73.6% (Adjusted R^2 = 49.0%) of the variance, F(2, 18) = 10.61, p = .001, in Self-compassion for the Breast Cancer group. The regression coefficients demonstrated that Hyper-arousal (β = -.43, p = .017, sr^2 = .17% and Age diagnosed (β = .55, p = .003, sr^2 = .22%; power was calculated at .99) were significant unique predictors of Self-compassion in individuals diagnosed with Breast Cancer. Correlation coefficients demonstrated that no significant relationship was found between EMWS and Self-compassion or any of the other psychosocial variables for the Breast Cancer group investigated in this study.

Conclusion Predictor Variables for Age Diagnosed - Self-Compassion & Hyper-arousal

Scleroderma: Results demonstrated that early life experiences low in warmth and safety and low Self-compassion (as well as a diagnosis of scleroderma at a younger age) contributed to elevated levels of Hyper-arousal. Indicating that Scleroderma participants reporting fewer experiences of warmth and safety, fewer experiences of Self-compassion and an earlier onset of Scleroderma, experienced greater levels of Hyper-arousal.

Breast Cancer: Results for the Breast Cancer group demonstrated that lower Hyper-arousal (as well as a diagnosis of Breast Cancer at an older age) predicted greater Self-compassion. Indicating that individuals who engaged in greater Self-compassion were likely to experience lower levels of Hyper-arousal (conversely greater Hyper-arousal predicted lower Self-compassion) and report, a later onset of Breast Cancer.

These experiences demonstrated differences in how Self-compassion and Hyper-arousal were experienced by the two illness groups. With lower Self-compassion and limited EMWS predicting elevated Hyper-arousal for Scleroderma participants and greater Self-compassion predicting lower Hyper-arousal (conversely lower Self-compassion predicted greater Hyper-arousal) for Breast Cancer participants. Elevated levels of Hyper-arousal also predicted a diagnosis of Scleroderma at a younger Age; whereas greater Self-compassion was predicted by a diagnosis of Breast Cancer at an older Age.

The results indicated that greater Self-compassion predicted lower experiences of arousal. Results also demonstrated that individuals diagnosed with Scleroderma who experienced low EMWS were also likely to experience greater levels of Hyper-arousal. No relationship was found between EMWS and any psychosocial variable for the Breast Cancer group. Results demonstrated differences in predictor variables for Age diagnosed with scleroderma and Age diagnosed with breast cancer; with higher levels of Self-compassion (lower Hyper-arousal related to higher Self-compassion) related to a later diagnosis of Breast Cancer (conversely lower Self-compassion was related to a diagnosis of Breast Cancer at a younger age). Whereas greater Hyper-arousal (low Self-compassion and low experiences of EMWS were related to elevated Hyper-arousal) and an earlier onset of Scleroderma (greater Self-compassion and greater early life experiences of warmth and safety were related to lower arousal). Conversely lower arousal was related to a later diagnosis of Scleroderma, indicating differences between groups for what relates to age of disease onset.

Conclusion- Hypothesis Four

Results provided partial support for the fourth hypothesis, demonstrating differences in what relates to Age diagnosed with scleroderma and Age diagnosed with breast cancer. Higher levels of Self-compassion was related to a diagnosis of Breast Cancer at an older Age (Conversely lower Self-compassion was related to a diagnosis of Breast Cancer at a younger Age). Whereas elevated levels of Hyper-arousal was related to a diagnosis of Scleroderma at a younger Age (Conversely lower Hyper-arousal was related to a diagnosis of Scleroderma at an older Age). Greater Self-compassion was related to lower Hyper-arousal for individuals diagnosed with Breast Cancer. However lower Self-compassion and limited experiences of warmth and safety was related to Hyper-arousal for individuals diagnosed with Scleroderma.

Results demonstrated that differences occurred between groups for what relates to Age of diagnosis for the two illness groups and the variables that underlie the significant variables for Scleroderma participants diagnosed at a younger Age (elevated Hyper-arousal: low Self-compassion & low EMWS) and Breast Cancer participants diagnosed at an older Age (greater Self-compassion: low Hyper-arousal).

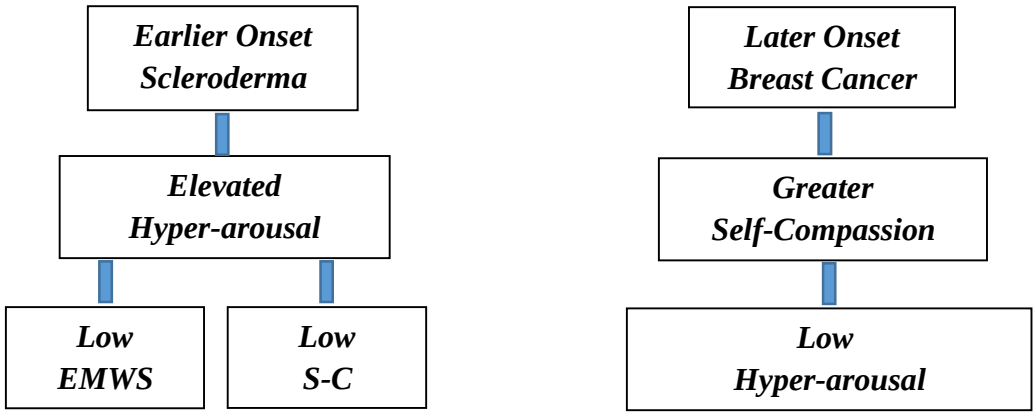

Figure 3: Scleroderma - Breast Cancer Model: Age of Disease Onset

Figure 3 above provides a visual representation of the results in the current study that suggest, EMWS (scleroderma), Self-compassion (S-C) and Hyper-arousal are involved in the earlier (greater hyper-arousal; lower self-compassion) or later (greater self-compassion; lower hyper-arousal) onset of Scleroderma and Breast Cancer.

Conclusion Summary - Hypotheses Four: Age of Onset Scleroderma/Breast Cancer

Results demonstrated differences between illness groups for predictor variables for Age diagnosed with scleroderma and Age diagnosed with breast cancer. Greater Self-compassion was related to Breast Cancer onset at an older age. Whereas elevated Hyper-arousal was related to Scleroderma onset at a younger age. Significant variables for greater Self-compassion for Breast Cancer was lower Hyper-arousal; and greater Hyper-arousal for Scleroderma were related to low Self-compassion and EMWS.

Results demonstrated differences between the groups for what predicts Age of diagnosis for Scleroderma and Breast Cancer participants and the variables that underlie the predictor variables (Hyper-arousal and Self-compassion) for the two illness groups. Scleroderma: diagnosed at a younger Age (elevated Hyper-arousal: *low Self-compassion & low EMWS*) and for Breast Cancer: diagnosed at an older Age (greater Self-compassion: *low Hyper-arousal*).

Study 3(b)

Comparison Study: Scleroderma, Breast Cancer and Community Groups

The third study 3(b) also investigated differences between Scleroderma (total sample and diffuse/limited groups), Breast Cancer and Community participants and psychosocial variables explored in studies one and two. Differences between groups were explored in relation to psychosocial aspects with the postulation that the community group would have lower negative psychosocial experiences than both illness groups (breast cancer and scleroderma); and the breast cancer group would have lower negative psychosocial experiences than the scleroderma group (greater predisposition to the disease, rather than stress related).

The literature suggests individuals with breast cancer experience depression and anxiety at higher rates (Khan, 2012; Vardanima et al., 2010) than community individuals (e.g., APA, 2000; Pignone et al. 2002) and lower rates than individuals with scleroderma (Thombs et al., 2007; Beretta et al., 2006; Angelopoulos et al., 2001; Roca et al., 1996; Legendre et al, 2005); although, these studies did not involve direct comparisons.

The third study therefore investigated whether scleroderma participants have greater experiences of depression and anxiety and fewer positive rearing experiences and less self-compassion than breast cancer and community participants. This study also investigated comparisons between breast cancer and community participants on psychosocial variables. These aspects are outlined in the following hypotheses.

The hypotheses were divided into three headings. Hypotheses 5-7: Comparison studies between scleroderma, diffuse and limited sclerosis, breast cancer and community groups and psychosocial and mental health variables.

Hypotheses 5-7: Scleroderma/Breast Cancer/Community – Psychosocial/Mental Health

Hypothesis Five: Comparison between Groups – Psychosocial Variables

5(a): Lower levels of Self-compassion, Emotion Regulation (Suppression), EMWS, Insecure Attachment (Dismissive/Fearful) and higher levels of Hyper-arousal would be reported by individuals diagnosed with Scleroderma and Breast Cancer when compared with Community participants.

5(b): When comparing (Scleroderma/Breast Cancer, Scleroderma/Community, Breast Cancer/Community) groups, more negative levels of psychosocial variables (EMWS, Attachment style, Emotion Regulation and Hyper-arousal) would occur between each of the illness groups (Scleroderma/Breast Cancer) when compared to the community groups; with differences occurring in levels of psychosocial variables between illness groups (Scleroderma/Breast Cancer).

Hypothesis Six: Scleroderma/Breast Cancer/Community-Mental Health

6(a): Individuals diagnosed with Scleroderma and Breast Cancer (illness group) would report higher levels of Depression, Anxiety and Stress when compared to individuals from the Community sample.

6(b): Scleroderma participants would report higher levels of Depression, Anxiety and Stress, than Breast Cancer participants who would report higher levels than the Community group.

Hypothesis Seven: Diffuse/Limit/Breast Cancer/Community–Psychosocial/Mental Health

Lower levels of EMWS, Self-compassion, the emotion regulation strategy – Suppression, an Insecure Attachment style and higher levels of Hyper-arousal would be reported by the Breast Cancer group when compared to the Community group and by the Scleroderma groups (diffuse and limited sclerosis) when compared with the Community and Breast Cancer groups.

Data Analysis

The breast cancer, community and scleroderma (diffuse/limited/ other forms of scleroderma) data files were merged to address the hypotheses. Several variables were skewed including, Dismissive attachment, Fearful attachment, Suppression, Pain, Anxiety, Depression and Stress subscales of the DASS (positively skewed) and EMWS, Suppression and Self-compassion (negatively skewed).

One case of extreme univariate outliers for each of the relationship subscales dismissive and fearful attachment were identified and removed (as recommended by Tabachnick & Fidell, 2007); however, these variables remained skewed. As a majority of the variables were skewed, non-parametric analysis was conducted.

Results for Hypothesis Five – Comparison: Scleroderma/Breast Cancer/Community

Hypothesis 5(a): Kruskal-Wallis analysis was utilized to investigate the hypothesis

that lower Self-compassion, Emotion Regulation, EMWS, an Insecure Attachment Style and higher levels of Hyper-arousal would be reported by individuals diagnosed with Scleroderma and Breast Cancer when compared with Community participants. Results demonstrated that the Self-compassion subscales Over-identification, and Self-kindness were significantly higher for the Scleroderma group when compared with the other groups. Mean Rank and median scores for Over-identification were higher for the Scleroderma group (94.18, n = 80), *Md*, 16.0, when compared to the Breast Cancer, (64.39, n = 22), *Md*, 13.0 and Community groups (67.74, n = 58), *Md*, 13.0 reporting similar scores, χ^2, 14.15, 2*df*, p =.001.

Mean rank and medium scores for Self-kindness were lower for the Scleroderma group (72.30, n = 81), *Md*, 14.0 when compared to the Breast Cancer (80.86, n = 22), *Md*, 15.0 and Community groups, (93.21, n = 58), *Md*, 15.0, χ^2, 6.84, 2*df*, p =.033. Although the results for EMWS did not reach significance, the Scleroderma group reported lower levels of EMWS (79.17, n = 88), *Md*., 71.5 than the Breast Cancer (85.32, n = 22), *Md*., 80.0 and Community groups (97.20, n = 62), *Md*., 82.0, χ^2, 4.82, 2*df*, p=.090.

Results for hypothesis 5(a) demonstrated that (low Self-compassion) Over-identification was higher for the Scleroderma group, than for the Breast Cancer and Community groups while Self-kindness was lower in the Scleroderma group than for the Breast Cancer and Community groups. The Scleroderma group also reported lower levels of EMWS than the Breast Cancer and Community groups, although these results did not reach statistical significance. The results partially supported hypothesis 5(a) and demonstrated that individuals diagnosed with Scleroderma were more likely to Over-identify (low self-compassion) with their experiences and less likely to engage in Self-kindness (greater self-compassion) than the Community and Breast Cancer groups who reported similar experiences in relation to self-compassion and EMWS (medium scores). Results are presented in Table 18. Please see appendix H for Means and SD for variables for the three groups.

Table 18

Summary of Results (Kruskal-Wallis) for Scleroderma – Breast Cancer – Community Groups

Variables	*N*	*MR*	*Md*
Over-Identification			
Scleroderma	80	94.18	16.0
Breast Cancer	22	64.39	13.0
Community	58	67.74	13.0
Self-Kindness			
Scleroderma	81	72.30	14.0
Breast Cancer	22	80.86	15.0
Community	51	93.21	15.0
EMWS (non-significant)			
Scleroderma	88	79.17	71.5
Breast Cancer	22	85.32	80.0
Community	62	97.20	82.0

Results for hypothesis 5(b): Comparing Scleroderma and Breast Cancer groups, Scleroderma and Community groups, and Breast Cancer and Community groups; it was postulated that more negative levels of psychosocial variables (EMWS, Attachment style, Emotion Regulation and Hyper-arousal) would occur between each of the illness groups when compared to the community groups; and that difference would occur between illness groups for these variables. That is elevated levels of different psychosocial variables would occur between the Scleroderma and Breast Cancer groups.

Scleroderma - Breast Cancer: Mann Whitney U Tests were conducted to compare variables of interest (EMWS, Insecure Attachment, Self-compassion, Emotion Regulation and Hyper-arousal) in the Scleroderma and Breast Cancer samples. Significant differences were found for Over-identification (low Self-compassion) between Scleroderma (55.46, n = 80), *Md*, 16.0, and Breast Cancer participants (37.09, n = 22), *Md*, 13.0, U = 563.0, z = -2.59, p = .010, r = - 0.26; and for Fearful attachment, between Scleroderma (51.08, n = 86) *Md*, 9.0, and Breast Cancer participants (67.86, n = 22), *Md*, 12.0, U = 652.0, z = -2.25, p = .024, r = - 0.22.

Therefore individuals diagnosed with Scleroderma had significantly higher median scores for Over-Identification (low self-compassion) and significantly lower scores for insecure Fearful attachment than individuals diagnosed with Breast Cancer; indicating that Scleroderma participants were more likely to engage in lower self-compassion by Over-Identifying with their experiences than Breast Cancer participants; whereas individuals diagnosed with Breast Cancer were more likely to engage in a Fearful style of relating when compared with Scleroderma participants.

Results demonstrated differences between psychosocial variables implicated in the respective diseases (scleroderma and breast cancer); partially supporting hypothesis 5(b). Results are presented in Table 17.

Table 17

Summary of Results (Mann Witney U Test) Scleroderma and Breast Cancer Groups

Variables	*N*	*MR*	*Md*
Over-Identification			
Scleroderma	80	55.46	16.0
Breast Cancer	22	37.09	13.0
Fearful Attachment			
Scleroderma	86	51.08	9.0
Breast Cancer	22	67.86	12.0

Scleroderma – Community: Mann Whitney U Tests were also conducted to compare variables of interest (EMWS, Self-compassion, attachment style, Hyper-arousal and the emotion regulation strategy - Suppression) in the Scleroderma and Community samples. Significant differences were found for Early Memories of Warmth and Safety and the Self-compassion subscales (greater self-compassion: Self-kindness and Mindfulness and low self-compassion: Over-identification).

EMWS: Results demonstrated significantly higher scores on Early Memories of Warmth and Safety for the Community group, (85.02, $n = 62$) *Md*, 82.0, when compared with the individuals diagnosed with Scleroderma (67.09, $n = 88$), *Md*, 71.5. $U = 2137.5$, $z = -2.25$, $p = .024$, $r = -0.18$.

Self-kindness: Results revealed significantly higher scores on Self-kindness (greater

self-compassion) for the Community group, (80.43, *n* = 58), *Md*, 15.0, when compared with the individuals diagnosed with Scleroderma (62.5316 *n* = 81), *Md*, 14.0, *U* = 1744.0, *z* = -2.59, *p* = .010, *r* = - 0.22.

Mindfulness: Results for Mindfulness revealed significantly higher scores for the Community group, (79.16, *n* = 58), *Md*, 14.0, when compared with the Scleroderma group (63.44, *n* = 81), *Md*, 12.5, *U* = 1818.0, *z* = -2.28, *p* = .023, *r* = - 0.19.

Over-identification: Results for Over-identification (low self-compassion) revealed significantly lower scores for Community participants (56.09, *n* = 58) *Md*, 13.0 when compared with Scleroderma participants (79.22, *n* = 80), *Md*, 16.0, *U* = 1542.50, *z* = -3.37, *p* = .001, *r* = - 0.29.

Results indicated that Scleroderma participants have significantly lower early life experiences of warmth and safety and significantly lower experiences of Self-compassion (low Self-kindness and Mindfulness and high engagement in Over-identifying with experiences) when compared with Community participants.

Conclusion – Hypothesis Five

Scleroderma – Breast Cancer – Community: Results for hypotheses 5(a) demonstrated that individual's diagnosed with Scleroderma reported lower Self-Compassion experiences (Over-identification and Self-kindness) when compared to Breast Cancer and Community participants; indicating that these emotion regulation strategies were more greatly experienced by Scleroderma participants; partially supporting hypothesis 5(a).

Scleroderma – Community: Results for hypothesis 5(b) also demonstrated that Scleroderma participants were more likely to Over-identify with their experiences (low Self-compassion) and were less likely to engage in strategies high in Self-compassion, (Self-kindness and Mindfulness) and have fewer experiences of Warmth and Safety in childhood when compared with Community individuals. Indicating that differences in reported early life

experiences and the capacity for Self-compassion occurred between Scleroderma and Community participants, with Scleroderma participants reporting more negative experiences than Community participants; partially supporting the hypothesis. Results for the scleroderma community study are presented below in Table 19.

Table 19

Summary of Results (Mann Witney U Test) Scleroderma and Community

Variables	*N*	*MR*	*Md*
EMWS			
Scleroderma	88	67.09	71.5
Community	62	85.02	82.0
Self-Kindness			
Scleroderma	81	62.53	14.0
Community	58	80.43	15.0
Mindfulness			
Scleroderma	81	63.44	12.5
Community	58	79.16	14.0
Over-Identification			
Scleroderma	80	79.22	16.0
Community	58	56.09	13.0

Scleroderma - Breast Cancer: Results for hypothesis 5(b) demonstrated that Scleroderma participants were more likely to Over-identify with their experiences than Breast Cancer participants; whereas Breast Cancer participants were more likely to engage in a Fearful attachment style when compared to Scleroderma participants. Results demonstrated differences between psychosocial variables implicated in the respective diseases; partially supporting hypothesis 5(b).

Breast Cancer - Community: Mann Whitney U Tests were also conducted to identify differences in psychosocial variables between participants in the Community group and individuals diagnosed with Breast Cancer; however, none of the variables reached statistical significance. Therefore no significant difference occurred between the Community and Breast Cancer groups on these variables; indicating that this part of hypothesis 5(b) was not supported.

Conclusion Fifth Hypothesis

Individuals diagnosed with Scleroderma demonstrated lower levels of Self-compassion than both groups and lower early life experiences of warmth and safety than Community participants. Whereas Breast Cancer participants reported greater experiences of Fearful attachment than Scleroderma participants. No significant difference was found between Breast Cancer and Community participants for psychosocial variables. Findings suggest that significant differences occurred on some psychosocial variables between Scleroderma, Breast Cancer and Community participants. Therefore findings partially supported the fifth hypothesis.

Results for Hypothesis Six – Mental Health

Hypothesis 6(a): Higher levels of Depression, Anxiety and Stress would occur between illness groups compared to the community group; with the scleroderma group reporting greater scores for mental health. The percentage of individuals who experienced

differing levels of Depression, Anxiety and Stress (as measured by the DASS) were determined using frequencies.

Hypothesis 6(b): Mann Witney U tests were utilized to investigate the part of the sixth hypothesis: that individuals from the illness groups (Scleroderma/Breast Cancer) would report higher scores for Depression, Anxiety and Stress than individuals from the Community group.

Illness (Scleroderma & Breast Cancer Groups) – Community Groups: Depression- Anxiety

Results revealed higher levels of Depression, Anxiety and Stress in the total illness group (Scleroderma/Breast Cancer) when compared to the Community group. The illness group reported approximately twice the levels of elevated Anxiety as individuals from the Community group; with the Community group reporting approximately twice the percentage of individuals within the normal range for Anxiety, when compared with the illness group. Results demonstrated that the illness group (Scleroderma/ Breast Cancer) reported more severe Anxiety than the Community group; results that partially supported the sixth hypothesis.

Scleroderma - Breast Cancer: Depression, Anxiety and Stress

A higher percentage of individuals diagnosed with Scleroderma reported elevated levels of Anxiety, Depression and Stress when compared to individuals diagnosed with Breast Cancer. A greater percentage of individuals diagnosed with Breast Cancer also reported scores within the normal range for Depression, Anxiety and Stress when compared with individuals diagnosed with Scleroderma. Results presented in Table 20 demonstrate the percentage of Community, Breast Cancer and Scleroderma participants in terms of their responses on the Depression, Anxiety and Stress Scale.

Table 20

Percentages - Depression, Anxiety & Stress for Scleroderma - Breast Cancer - Community

Variable		Community	Total illness *(Scleroderma & Breast Cancer)*	Breast Cancer	Scleroderma
Depression					
0-9	Normal	61.9%	44.7%	50.0%	43.5%
10-13	Mild	28.6%	32.5%	31.8%	38.0%
14-20	Moderate	9.5%	13.2%	5.4%	9.8%
21-27	Severe		9.6%	13.7%	8.7%
28+	Ex Severe				
Anxiety					
0-7	Normal	36.5%	19.1%	22.7%	18.3%
8-9	Mild	34.9%	23.5%	27.3%	22.6%
10-14	Moderate	28.6%	43.5%	45.5%	43.0%
15-19	Severe		13.0%	4.5%	15.0%
20+	Ex Severe		0.9%		1.1%
Stress					
0-14	Normal	90.5%	76.3%	81.8%	75.0%
15-18	Mild	7.9%	15.8%	13.7%	16.3%
19-25	Moderate	1.6%	7.9%	4.5%	8.7%
26-11	Severe				
34+	Ex Severe				

Mann Whitney U Tests: Results for Mann Whitney U Tests demonstrated significantly lower Depression for Community individuals (65.4, *n* = 63) *Md* = 8.0, when compared with those diagnosed with Scleroderma (86.6, *n* = 91), *Md*, 10.0, *U* = 2105.0, *z* = -2.92, *p* = .003, *r* = - 0.24. Significantly lower Anxiety for Community, 39.2, *n* = 63), *Md*, 8.0, when compared to Breast Cancer participants (53.9, *n* = 22), *Md*, 9.5, *U* = 453.0, *z* = -2.47, *p* = .014, *r* = - 0.27 and significantly lower Anxiety for Community (58.5, *n* = 63), *Md*, 8.0, when compared with Scleroderma participants (92.0, *n* = 93), *Md*, 10.0, *U* = 1671.5, *z* = - 4.60, *p* = .000, *r* = - 0.37. Lower Anxiety for Breast Cancer (51.1, *n* = 22), *Md*, 9.5, when compared with Scleroderma participants (59.6, *n* = 93), *Md*, 10.0; however, these results did not reach significance. Stress was not significantly related to any variable. Significant results are presented in Table 21.

Table 21

Summary of Significant Results (Mann Witney U) Breast Cancer/Scleroderma/Community

Variables	*N*	*MR*	*Md*
Depression			
Scleroderma	91	86.6	10.0
Community	63	65.4	8.0
Anxiety			
Scleroderma	93	92.0	10.0
Community	63	58.5	8.0
Breast Cancer	22	59.6	9.5
Community	63	39.2	8.0

Results demonstrated that significantly higher levels of Depression and Anxiety were experienced by individuals diagnosed with Scleroderma when compared with Community individuals. No significant difference was found between Breast Cancer and Scleroderma participants and Breast Cancer and Community participants for levels of Depression. Significantly higher levels of Anxiety were experienced by individuals diagnosed with Scleroderma and Breast Cancer when compared with Community individuals. No significant difference was found between Breast Cancer and Scleroderma participants for Anxiety. There were no significant differences between groups for Stress.

Conclusion - Hypothesis Six

Findings indicated that those with illness (Scleroderma/Breast Cancer) showed higher DASS scores for Depression and Anxiety than the Community participants. DASS Scores for Depression for Community participants ranged from normal to moderate with over 90% of this group reporting normal to mild depression. The illness groups' DASS scores ranged from normal to severe, with a majority of this group experiencing mild to severe levels of depression. DASS Scores for Anxiety for community participants ranged from normal to moderate with over 70% of this group reporting normal to mild Anxiety. The illness groups' scores ranged from normal to extremely severe with a majority of this group experiencing mild to extremely severe levels of depression.

Results demonstrated significant findings for Scleroderma participants in relation to greater experiences of Depression and Anxiety when compared with Community participants. Significantly greater experiences of Anxiety were also reported by Breast Cancer participants when compared with Community participants. Therefore individuals diagnosed with Scleroderma and Breast Cancer tend to experience greater levels of Anxiety than Community participants. While Scleroderma participants experienced greater levels of Anxiety they also experienced greater levels of Depression when compared to Community participants.

Table 22 below provides a summary of significant variables from the third study (a/b) for Depression, Anxiety and Stress for the Scleroderma and Breast Cancer groups and the Scleroderma, Breast Cancer and Community groups.

Table 22

Significant Variables: Scleroderma/Breast Cancer/Community – Mental Health

Differences Between Groups	***Depression***			***Anxiety***			***Stress***		
	Sig MR/C		***Between Grps***	***Sig MR/C***		***Between Grps***	***Sig MR/C***		***Between Grps***
	S	***BC***	***S BC C***	***S***	***BC***	***S BC C***	***S***	***BC***	***S BC C***
Between Groups			***H L***			***H H L***			
EMWS	X			X			C		
Fearful Attachment	C						C		
Dismissive Attachment	C	X						C	
Low Self-Compassion	X	X					X	C	
Self-Judgment				C					
Isolation				C					
Suppression	C			X	X				
Hyperarousal				X			X	C	
Pain				X	C				
Nausea		C						C	
Fatigue		X						C	

S= Scleroderma BC = Breast Cancer C = Community Groups

MR = Multiple Regression, X = Significant Predictor Variables, C = Sig Correlations

Between Groups: H = Significantly Higher, L = Significantly Lower

Results demonstrated that individuals diagnosed with Scleroderma experience greater psychopathology when compared to the Community and Breast Cancer groups, partially supporting hypothesis six.

Conclusion - Results Hypothesis Six: Depression, Anxiety and Stress

Overall results for Depression, Anxiety and Stress provided partial support for the hypothesis and demonstrated that similarities and differences occurred between groups for scores on the DASS. Findings for hypothesis 6(a) demonstrated higher DASS scores for illness participants for Depression and Anxiety than for Community participants. Significant difference occurred between Scleroderma participant's experiences of (elevated) Depression and Anxiety when compared to Community participants. Significantly elevated Anxiety was also experienced by Breast Cancer participants when compared to Community participants. Scleroderma and Breast Cancer participants therefore tended to experience greater levels of Anxiety than Community participants. Whereas Scleroderma participants experienced greater levels of Anxiety and Depression when compared to Community participants.

Results – Hypothesis Seven: Diffuse - Limited - Breast Cancer - Community Groups

A Kruskal-Wallis Test was conducted to investigate significant differences between the two major subsets of Scleroderma (diffuse and limited sclerosis groups), the Breast Cancer group and the Community group on psychosocial variables. The Self-compassion subscales Over-identification, Self-kindness and Mindfulness were significant, demonstrating that differences occurred between the groups.

Results revealed a similar mean rank and medium scores for Over-identification for the Community (64.96, n = 58), *Md*, 13.0 and Breast Cancer groups, (61.68, n = 22), *Md*, 13.0, when compared with the Limited sclerosis, (88.36, n = 42), *Md*, 15.5 and Diffuse sclerosis groups, (95.02, n = 31), *Md*, 16.0, χ^2, 14.92, 3*df*, p =.002, who reported higher scores, indicating lower self-compassion. Results are presented in Table 22.

Table 22

Summary of Significant Results for Diffuse –Limited – Breast Cancer - Community

Variables	*N*	*MR*	*Md*
Over-Identification			
Diffuse	34	95.02	16.0
Limited	50	57.41	15.5
Breast Cancer	22	61.68	13.0
Community	63	64.96	13.0
Self-Kindness			
Diffuse	34	85.05	16.0
Limited	50	88.36	13.0
Breast Cancer	22	76.89	15.0
Community	63	88.59	15.0
Mindfulness			
Diffuse	34	87.48	13.0
Limited	50	60.35	12.0
Breast Cancer	22	71.45	15.0
Community	63	87.17	14.0

Mean rank and medium scores for Self-Kindness were higher for the Community, (88.59, *n* = 63), *Md*, 15.0, Breast Cancer (76.89, *n* = 22), *Md*, 15.0, and Diffuse groups (85.05, *n* = 34), *Md*, 16.0, compared to the Limited group, (57.41, *n* = 50), *Md*, 13.0, χ^2,

13.28, 3*df*, *p* =.004. Mean Rank and medium scores for Mindfulness were higher in the Community group, (87.17, *n* = 63), *Md*, 14.0, and Breast Cancer group (71.45, 22), *Md*, 13.5 when compare with the Diffuse, (87.48, *n* = 34), *Md*, 13.0, and Limited sclerosis groups, (60.35, *n* = 50), *Md*, 12.0, χ^2, 11.15, 3*df*, *p* =.011. Although EMWS did not reach significance the Community group, (91.37, *n* = 63), *Md*, 82.0, reported higher scores than the Breast Cancer group, (80.41, *n* = 22), *Md*, 80.0, with both groups reporting higher scores than the Limited, (78.50, *n* = 50), *Md*, 72.0, and Diffuse groups (70.1, n = 34), *Md*, 71.5, χ^2, 4.77, 3*df*, *p* =.189.

Results indicated similar scores for Over-identification (low self-compassion) for the Community and Breast Cancer groups; that were significantly lower than scores for the Limited and Diffuse groups. The Diffuse group reported higher median scores than all groups for Over-identification.

Self-kindness was higher in the Community, Breast Cancer and Diffuse groups, when compared with the Limited group; indicating that the Limited group were less likely to engage in acts of Self-kindness than Community, Breast Cancer or Diffuse sclerosis participants, with the Diffuse group reporting the highest of all the groups for Self-kindness.

Results for Mindfulness indicated higher medium scores for the Breast Cancer group when compared to the Community group that reported higher scores than the Diffuse group. All groups demonstrated significantly higher median scores than the Limited group. Results indicated that the Limited group engaged in less Mindfulness than the remaining three groups; with the two Scleroderma groups demonstrating less Mindfulness than the Community and Breast Cancer groups.

Conclusion - Hypothesis Seven

Table 23 below, provides a summary of results for positive and negative outcomes for the Scleroderma groups and the Community and Breast Cancer groups.

Table 23

Summary of Significant Variables: Positive and Negative Outcomes Between Groups

	Negative Outcomes					**Positive Outcomes**				
	Sclero	***Diff***	***Lim***	***BC***	***Com***	***Sclero***	***Diff***	***L***	***BC***	***Com***
EMWS	**Low** Lower	**Low**	**Low**							Higher
Fearful Attachment	**High**	**High**		Higher		Lower				
Dismissive Attachment	**High**		**High**	**High**						
Self-Compassion	**Low** Lower			**Low**					Higher	Highest
Self-Kindness	**Low** Lower	**Low**	Lowest				Highest		**High** Higher	Higher
Mindfulness	Lower	Lower	Lowest						Highest	Higher
Over-Identify	**High** Higher	**High** Highest	**High** Higher						Lowest	Lowest
Self-Judgement	**High**		**High**							
Isolation	**High**	**High**								
Suppression	**High**	**High**	**High**	**High**						
Re-appraise			Lower							Higher
Hyperarousal	**High**		**High**	**High**					**Low**	
R-Hyperarousal	**High**	**High**								Lower
Depression	Higher								Lower	Lowest
Anxiety	Highest			Higher						Lower
Age Onset	Earlier								Later	

Sclero = Scleroderma Symptoms: Pain, Raynaud's, Disability, Intestinal, Breathing and Skin.

Diff = Diffuse Sclerosis, Lim = Limited Sclerosis, BC = Breast Cancer, Com = Community Group.

Table 23 provides a summary of variables that were significant for each of the groups. The table is divided into positive and negative outcomes and provides an overview of the direction of results (**low or high**) for the psychological variables that were related to disease symptoms, onset or mental health; demonstrating more negative outcomes for the

scleroderma groups. Comparison between groups for significant variables are represented by lower, lowest, higher and highest and also generally demonstrate more negative outcomes for the scleroderma groups when compared to the other groups. For example, between two groups: EMWS was lower in the scleroderma group and higher in the community group.

Results partially supported the hypothesis with the Scleroderma groups (Diffuse/Limited sclerosis) generally reporting significantly lower Self-compassion than the Breast Cancer and Community groups that generally reported similar scores. The Diffuse group engaged in significantly greater Over-identification strategies than all groups, while the Limited group engaged in less Self-kindness and Mindfulness than the other three groups with the Diffuse group reporting less Mindfulness than the Breast Cancer and Community groups and greater Self-kindness than all groups.

Conclusion S**ummary - Hypotheses**

Conclusion** S**ummary - Hypotheses 5-7: Comparison between Groups

Results partially supported hypotheses 5-7: Scleroderma participants demonstrated significantly lower Self-compassion than Community and Breast Cancer groups and significantly lower EMWS than Community participants. Breast Cancer participants reported significantly greater experiences of Fearful attachment than Scleroderma participants. Scleroderma participants reported greater mental health scores (DASS) for depression and anxiety. Findings therefore partially supported hypotheses five, six and seven and suggest that significant differences were found between groups for psychosocial and mental health experiences; with scleroderma participants generally reporting more negative experiences.

Summary of Results: Hypotheses 1-7

Study 3(a/b) - Comparison: More Negative Outcomes for the Scleroderma Groups

Scleroderma/Breast Cancer/Community: Results partially supported the hypotheses related to differences between groups (scleroderma, breast cancer and community) for

psychosocial variables. Scleroderma participants demonstrated significantly less self-compassion (over-identification and self-kindness) than breast cancer and community participants. Results demonstrated that significant differences occurred between groups for self-compassion, with scleroderma participants engaging in significantly less compassion toward themselves than individuals from the breast cancer and community groups.

Scleroderma/Breast Cancer: Results also partially supported the hypothesis by demonstrating significant differences in experiences of over-identification and fearful attachment style in individuals diagnosed with scleroderma (limited, diffuse and rarer forms of scleroderma) when compared to individuals diagnosed with breast cancer. Scleroderma participants were more likely to over-identify with their experiences (low self-compassion) than breast cancer participants. Whereas individuals diagnosed with breast cancer were more likely to engage in a fearful style of relating when compared to individuals with scleroderma. Findings demonstrated significant differences in how the illness groups relate to themselves and their experiences (low self-compassion: over-identifying with experiences) and to significant others (insecure attachment style: fearful attachment).

Differences in Predictor Variables – Scleroderma/Breast Cancer: Results from study 3(a) demonstrated that early life experiences low in warmth and safety and an insecure dismissive attachment style predicted greater experiences of pain related to disease symptoms for the scleroderma group; however these factors (EMWS and dismissive attachment) did not predict pain for individuals diagnosed with breast cancer. Therefore differences occurred between groups for what related to pain in the scleroderma and breast cancer groups. Results also demonstrated differences in predictor variables for age diagnosed with disease; for the scleroderma group, elevated levels of hyper-arousal predicted a diagnosis of scleroderma at a younger age; whereas greater self-compassion predicted a diagnosis of breast cancer at an older age. The results also indicated that greater self-compassion predicted lower experiences

of arousal and lower self-compassion predicted greater hyper-arousal for both groups; whereas, low EMWS also predicted greater levels of hyper-arousal in the scleroderma group. No relationship was found between EMWS and any psychosocial variable for the breast cancer group. Results demonstrated differences between groups for what predicts disease related symptoms and onset; partially supporting the hypotheses for comparison between groups.

Scleroderma/Community: Results also partially supported the hypothesis, and demonstrated that significant differences occurred between the scleroderma and community groups. Individuals with scleroderma were likely to have fewer experiences of warmth and safety as a child than community individuals and were less likely to engage in self-compassion strategies of self-kindness and mindfulness and more likely to engage in strategies (low self-compassion) high in over-identifying with their experiences, when compared with community participants.

Breast Cancer/Community: Results conducted to identify differences in psychosocial variables between individuals diagnosed with breast cancer and community individuals were not significant and therefore did not support this part of the hypothesis. Results indicated that no significant difference occurred between the community and breast cancer groups for psychosocial variables.

Scleroderma - More Negative Outcomes: Overall the results suggested that individuals diagnosed with scleroderma have significantly different experiences to those individuals from the community in relation to their early life experiences and significantly different experiences to breast cancer and community participants in their capacity to provide themselves with self-compassion. The results demonstrated that individuals diagnosed with scleroderma were more likely to have lower experiences of warmth and safety as a child and tended to demonstrate less compassion toward them-selves (by engaging in less self-kindness

and over-identifying to a greater extent with their experiences) than community and breast cancer participants (breast cancer: not significantly higher for EMWS) and by engaging in less mindfulness than community participants. Therefore scleroderma participants were more likely to engage in less self-compassion than the breast cancer and community groups who indicated similar scores on these variables, an experience that may be influenced by fewer experiences of warmth and safety as a child. Breast cancer participants however experienced greater fearful attachment than scleroderma participants.

Differences also occurred between the scleroderma and breast cancer groups for the variables EMWS and self-compassion and disease related variables pain and onset. Early life experiences low in warmth and safety and an insecure dismissive attachment style predicted greater experiences of pain related to disease symptoms for the scleroderma group; however these factors did not predict pain for the breast cancer group.

Results also demonstrated difference in predictor variables for age diagnosed with disease; with elevated hyper-arousal predicting a diagnosis of scleroderma at a younger age; and greater self-compassion predicting a diagnosis of breast cancer at an older age. Lower self-compassion predicted greater hyper-arousal, conversely greater self-compassion predicted lower arousal for both groups; whereas, low EMWS also predicted greater levels of `hyper-arousal for the scleroderma group.

EMWS was not significant for any variable for the breast cancer group. Results demonstrated differences between groups for what predicts disease related symptoms and onset. Therefore results for the biopsychosocial hypotheses for comparison between groups was partially supported.

Hypotheses - Comparison Mental Health: More Negative Outcomes - Scleroderma Group

Results investigating depression, anxiety and stress demonstrated that the community group reported lower scores on the depression, anxiety and stress scale (DASS) and a greater

percentage score within the normal range for depression, anxiety and stress when compared to the illness group (scleroderma and breast cancer). Approximately twice the percentage of community individuals reported anxiety scores within the normal range, when compared to the illness group.

As hypothesised these scores indicated that a higher percentage of community individuals did not experience elevated levels of depression, anxiety and stress, with twice the percentage of community individuals experiencing non-clinical levels of anxiety when compared with illness individuals. A higher percentage of scores on the DASS were also reported by the total illness group for depression, anxiety and stress, when compared with the community group, with the illness group reporting approximately twice the levels of elevated anxiety as individuals from the community group; indicating the illness group had twice the percentage of individuals experiencing clinical levels of anxiety than individuals from the community group.

When comparing depression, anxiety and stress (DASS) between the illness groups (scleroderma/breast cancer), as hypothesised, a higher percentage of scleroderma participants reported clinical levels of anxiety, depression and stress than those individuals diagnosed with breast cancer, and a greater percentage of individuals with breast cancer reported nonclinical scores for anxiety, depression and stress when compared with individuals diagnosed with scleroderma. Results indicated that a higher percentage of scleroderma participants reported clinical levels of anxiety, depression and stress than breast cancer and community participants. A greater percentage of the total illness group reported clinical levels of depression, anxiety and stress, with a higher percentage (twice that of community individuals) experiencing elevated anxiety when compared to community participants.

Results comparing differences between groups revealed significantly higher levels of anxiety and depression for individuals diagnosed with scleroderma when compared with

community individuals and significantly higher levels of anxiety for breast cancer participants when compared with community individuals. Results demonstrated, that overall similar levels of stress and depression were reported by breast cancer and scleroderma participants, however higher levels of anxiety were experienced by individuals diagnosed with scleroderma when compared to breast cancer participants, although these results did not reach significance. Therefore results partially supported the hypotheses comparing differences between illness and community groups in that scleroderma and breast cancer participants had significantly more psychopathology than community participants. Scleroderma participants reported significantly higher levels of anxiety and depression, whereas breast cancer participants reported significantly higher levels of anxiety when compared to community participants.

Results provide partial support for the hypotheses in that significantly higher levels of depression and anxiety where reported by individuals diagnosed with scleroderma when compared to community individuals and significantly higher levels of anxiety were experienced by breast cancer participants when compared to community participants.

Predictor Variables: Scleroderma/Breast Cancer - Depression, Anxiety and Stress

Predictor variables for depression, anxiety and stress for the scleroderma and breast cancer groups revealed that, low self-compassion predicted depression for both groups, while EMWS (scleroderma) and a dismissive attachment style (breast cancer) also predicted depression in the respective groups. Suppression predicted anxiety for both groups while a number of other variables (pain, early memories of warmth and safety, and hyper-arousal) predicted anxiety in scleroderma participants. While low self-compassion and elevated hyper-arousal predicted stress in the scleroderma group.

Results indicated that emotion regulation strategies low in self-compassion in both illness groups predicted depression, while suppression was a common predictor variable for

both groups (scleroderma/breast cancer) for anxiety. However differences supporting the hypothesis also occurred between groups for the remaining predictor variables for depression (scleroderma: EMWS; breast cancer: dismissive attachment) and anxiety (scleroderma: pain, EMWS and hyper-arousal). Low self-compassion and elevated levels of hyper-arousal predicted stress in the scleroderma group while no variable was a unique predictor of stress for the breast cancer group. Results indicated that although there were common predictor variables for depression and anxiety, differences also occurred between groups for the remaining variables that contributed to depression, anxiety and stress.

These results demonstrated that while some psychosocial predictor variables were similar for scleroderma and breast cancer groups for mental health factors, differences also occurred. Differences in predictor variables related to mental health, were found for a number of psychosocial and physiological factors that included early life experiences, attachment styles, hyper-arousal and pain. Findings therefore provided partial support for the hypothesis.

Comparison: Diffuse/Limited, Breast Cancer & Community Groups

Scleroderma Groups - More Negative Outcomes: Results partially supported the hypothesis that compared difference between psychosocial experiences in the two major subset of scleroderma (diffuse and limited sclerosis groups), the breast cancer group and the community group. Results demonstrated significant differences between the three illness groups and the community group on the self-compassion domains, over-identification, self-kindness and mindfulness. Breast cancer and community participants reported similar experiences with regard to over-identification. While limited and diffuse sclerosis participants reported higher experiences of over-identification, diffuse participants indicated higher levels of over-identifying than limited sclerosis participants. Self-kindness was higher in individuals diagnosed with diffuse sclerosis when compared to the remaining three groups. Individuals with limited sclerosis reported lower experiences of self-kindness than all the other groups,

whereas the breast cancer and community groups again reported similar scores. The community group reported higher mindfulness than all groups with the lowest scores reported by the scleroderma groups. Limited sclerosis participants reported the lowest experiences of self-compassion, for the domain mindfulness.

Results suggest that breast cancer and community participants have similar approaches of identifying with their experiences and that these experiences were significantly lower than for individuals with limited and diffuse sclerosis, who were more likely to over-identify with their experiences, and less likely to engage in mindfulness techniques. Self-kindness however was higher for diffuse sclerosis participants when compared with community individuals who reported lower scores than diffuse and higher scores then breast cancer participants. Breast cancer participants reported lower scores for self-kindness than community individuals and higher scores than those diagnosed with limited sclerosis. Limited sclerosis participants again reported the lowest scores of all the groups.

Results suggest that individuals diagnosed with limited sclerosis were less likely to engage in acts of self-kindness and mindfulness than the other illness groups (individuals with diffuse sclerosis and breast cancer) or those from the community group, however the diffuse sclerosis group were more likely to over-identify with their experiences than the other illness and community groups. Results also indicated that individuals with breast cancer were more likely to report similar experiences of self-compassion, when compared to community participants. These groups generally indicated higher levels of self-compassion than the scleroderma groups (except for the subscale self-kindness that was higher for the diffuse group).

Results suggest differences between the illness groups (more negative outcomes for scleroderma when compared to breast cancer) and similarities between the community and breast cancer groups for self-compassion; and therefore provide partial support for the

hypotheses.

Conclusion – Results: Scleroderma/Diffuse/Limited/Breast Cancer/Community Hypotheses

Results for study 3(a/b) indicated greater mental health problems for individuals diagnosed with scleroderma when compared to the breast cancer and community groups. Some similarities in predictor variables (low self-compassion and greater emotion suppression) for mental health between illness groups were found; however, differences also occurred between the breast cancer and scleroderma groups in that negative early nurturing experiences, low self-compassion and hyper-arousal predicted a number of negative mental health outcomes for the scleroderma group; whereas, dismissive attachment was the only other variable to predict any mental health factor (depression) for the breast cancer group. Findings that partially supported the comparison hypotheses for mental health.

Differences also occurred between the community, breast cancer and scleroderma groups with more negative early nurturing experiences (scleroderma: lower EMWS) and lower self-compassion reported by the scleroderma groups and greater reporting of fearful attachment for the breast cancer group when compared to the scleroderma group. These scleroderma experiences (EMWS and low self-compassion) along with hyper-arousal and dismissive attachment predicted disease related variables. Whereas greater self-compassion predicted more favourable disease related outcomes for the breast cancer group. Results generally indicated more negative outcomes for the scleroderma group when compared to the breast cancer and community groups and therefore provide partial support for the mental health and biopsychosocial group comparison hypotheses.

Discussion: Study 3(a/b)

Comparison: Scleroderma/Breast Cancer

Scleroderma: Low Self-Compassion - Breast Cancer: Fearful Attachment: When the total scleroderma sample (diffuse and limited sclerosis and rarer forms of scleroderma) was

compared with the breast cancer sample, significant differences were identified in experiences of over-identification and fearful attachment style. Individuals diagnosed with scleroderma reported greater experiences of over-identifying with their experiences than breast cancer participants and lower experiences of fearful attachment than individuals diagnosed with breast cancer. Results suggest that individuals diagnosed with scleroderma were more likely to over-identify with their experiences than breast cancer participants, suggesting individuals with scleroderma engage in strategies lower in self-compassion than individuals with breast cancer.

Lower scores for fearful attachment style were found for individuals diagnosed with breast cancer, when compared to scleroderma participants. This suggests that breast cancer participants were more likely to experience a fearful style of relating when compared with individuals with scleroderma. This attachment behaviour may reflect feelings of insecurity and emotional responses developed in early childhood. Heightened chronic experiences of distress in childhood that are not regulated externally by an attachment figure may affect the child's developing immune system and increase vulnerability to psychological and physiological health conditions across the lifespan (Schore, 1994). Breast cancer participants who reported a greater tendency toward a fearful way of relating to significant others may be more likely to engage in the use of avoidant behaviours that reflect difficulties in becoming close to and relying on others (Mikulincer & Shaver, 2007; Simpson & Rholes, 1998). Fearfully attached individuals have negative expectations of both the self and others and are extremely self-conscious, self-doubting, experience a sense of social insecurity and exhibit high levels of anxiety and arousal (Mikulincer & Shaver, 2007; Simpson & Rholes, 1998). These individuals tend to long for their partner's love and support, however they fear the possible negative consequences of intimacy and reliance on significant others. (Mikalincer & Shaver, 2007).

The findings of greater levels of fearful attachment in breast cancer participants may be partially explained by the difference in areas of the body affected by each of the diseases. The area affected by breast cancer may have a greater impact on these individual's view of attachment and fearful insecurity around how their partner may now view or feel toward them. Fearfully attached breast cancer participants may have negative expectations about being cared for and although they desire their partners love may use avoidant strategies due to experiencing a disease that affects a very female (for women in this study) part of the body that is connected to intimacy in a relationship. Feeling fearful and avoiding connecting with significant others (when the need for comfort and support to reassure and provide soothing experiences is great); suggests copying strategies that are likely to increase arousal levels and reduce the capacity to self-sooth or engage in behaviours likely to elicit support and care from significant others.

The findings suggest that breast cancer participants were more likely to exhibit an insecure fearful attachment style than scleroderma participants and although these findings demonstrate differences in emotion regulation strategies, both coping styles are likely to create elevated levels of arousal and influence immune system functioning; and may partially explain the mechanisms that underlie the development of these two diseases. Findings indicated differences between illness groups for psychosocial responses that may impact on the immune system, and demonstrate the importance of identifying how different stress experiences may impact on individuals with different disease symptoms, to inform psychological treatment.

Comparison: Scleroderma/Community

Scleroderma: Lower Self-Compassion and EMWS: Significant differences were found between the scleroderma (diffuse and limited sclerosis and rarer forms of scleroderma) and community groups, for scores on early memories of warmth and safety and the domains of

self-compassion (over-identification, self-kindness and mindfulness) for the community group when compared with individuals diagnosed with scleroderma. Scleroderma participants reported lower levels of self-compassion and experiences of warmth and safety as a child than individuals from the community sample. Self-compassion domain scores were lower for self-kindness and mindfulness and higher for over-identification (low self-compassion) for scleroderma participants when compared with community individuals.

Therefore scleroderma participants were likely to have fewer experiences of warmth and safety as a child than community individuals, were less likely to engage in self-compassion strategies of self-kindness and mindfulness and more likely to engage in strategies high in over-identifying with their experiences, when compared to community individuals. These negative early childhood experiences may have included few occurrences or role modelling of kindness, or experiences that provide opportunities to calm the self and down-regulate emotions. These negative experiences reduce the opportunity to disengage from practices involving extended over-identification (low self-compassion), that are likely to increase levels of arousal, influence immune system functioning and possibly contribute to the development of this disease.

Comparison: Breast Cancer/Community

No Significant Difference between Groups: Findings indicated that no significant difference was found between community and breast cancer participants on any of the psychosocial variables under investigation in this study.

Comparison: Scleroderma/Breast Cancer/Community Groups

*Scleroderma: Less Self-Compassion - Over-identification/Self-Kindness**:*** Results comparing individuals diagnosed with scleroderma, breast cancer and community participants and psychosocial variables, found that individuals diagnosed with scleroderma demonstrated less self-compassion (over-identification, and self-kindness) than the breast cancer and

community participants. Scleroderma participants tended to over-identify with their experiences when compared with breast cancer and community participants. Individuals with scleroderma engaged in less self-kindness than breast cancer and community participants and also experienced less early memories of warmth and safety than community individuals and lower experiences than breast cancer participants (however not significantly between the three groups). The Scleroderma group therefore tended to demonstrate less compassion toward them-selves than the other groups, perhaps at a time when being kind to one-self and not over-identifying (low self-compassion) with one's experience (associated with increased arousal in the current study) may be beneficial to an individual's emotional health.

When attempting to manage the emotional and physical effects of coping with a diagnosis of a chronic or life threatening disease; it is conceivable those individuals who engage in emotion regulation strategies low in self-compassion may be likely to over-identify with their experiences, and that this strategy may negatively impact on their individual illness experience; due to the engagement of over-identification with negative experiences that may include illness experiences. This strategy low in self-soothing may increase levels of negative arousal (hyper-arousal) and impact on disease symptoms. Lower early life experiences of warmth and safety may explain the significant difference between the groups in levels of self-kindness and over-identification. Scleroderma participants reporting lower self-kindness and greater experiences of over-identification were likely to have experienced less warmth and safety as a child. Limited exposure to compassionate care (warmth) and safe environments (safety) as a child may reduce the development of the self-soothing social mentality and the capacity to provide ones-self with compassionate soothing experiences in adulthood.

These results suggest that early life experiences deficient in nurturing and security are likely to influence an individual's ability to engage in compassionate soothing emotion regulation strategies and may explain the differences in levels of self-compassion experienced

between the groups.

Comparison Study: Diffuse/Limited/Breast Cancer/Community Groups

Limited: Less Self-Kindness/Mindfulness - Diffuse: Greater Over-identification: Results for individuals diagnosed with one of the major subsets of scleroderma (diffuse and limited sclerosis), breast cancer and community participants for psychosocial variables; demonstrated significant differences between the self-compassion domains of self-kindness, mindfulness and over-identification. Individuals diagnosed with limited and diffuse sclerosis were more likely to engage in strategies that involved over-identifying with their experiences than breast cancer and community participants (reporting similar experiences). Diffuse sclerosis participants were more likely to engage in higher levels of over-identification than individuals with limited sclerosis. Whereas limited sclerosis participants were more likely to engage in strategies lower in self-kindness than the other illness and community participants. Individuals with diffuse sclerosis engaged in higher levels of self-kindness than all other groups. Limited sclerosis participants engaged in less mindfulness than all other groups, whereas diffuse sclerosis participants reported higher scores on mindfulness than the limited group and lower scores than the breast cancer and community groups. The community group reported the highest score on mindfulness than all of the groups. Diffuse sclerosis participants were therefore more likely to over-identify with their experiences than the remaining groups and less likely to engage in mindfulness (than community and breast cancer participants).

Over-identifying experiences tend to reduce the likelihood of engaging in mindfulness as a strategy to manage difficult experiences. Limited sclerosis participants tended to over-identify with their experiences at a greater level than breast cancer and community participants and were also less likely to engage in strategies high in self-kindness and mindfulness than the other illness (diffuse sclerosis and breast cancer) or community participants. The limited group generally appear to exhibit less self-compassion than all other

groups, and may over-identify (low self-compassion) with experiences at a greater level than breast cancer and community participants as a result of not engaging in compassionate mindfulness when stressed or distressed. These individuals therefore are not mindfully aware they are engaging in over-identification and therefore are unable to utilize self-soothing compassionate strategies to calm the self. Ways of relating to self may therefore involve over-identifying with the stress experience rather than self-soothing a strategy that may have resulted in negative health consequences. Breast cancer and community participants tended to exhibit similar scores on the self-compassion variables.

Higher levels of over-identifying with one's experiences for diffuse sclerosis participants may result from the type of disease symptoms these individuals are likely to endure; such as skin thickening that involves rapid progression beginning in the extremities and advancing to the trunk early in the development of the disease. Other problematic issues include gastrointestinal disease and lung fibrosis (e.g., Bolster & Silver, 2008), the uncertainty of developing further symptoms, the disease course and likely prognosis. Although over-identifying with one's experiences is a negative domain of self-compassion, individuals with diffuse sclerosis were able to engage in self-compassion strategies of self-kindness at higher levels than other participants in this study, strategies that may help these individuals manage the emotional aspects of experiencing such disease symptoms.

Individuals with limited sclerosis tended to over-identify with their experiences at a greater level than breast cancer and community participants. This may also be explained by a difficulty in attempting to manage a range of symptoms that are different for most individuals; such as skin thickening in the extremities, Raynaud's phenomenon, finger ulcers, calcinosas, oesophageal and intestinal conditions, pulmonary hypertension, breathing problems, pain (e.g., Etkin et al.; Giuggioli et al., 2010) and uncertainty of the disease course.

However unlike the diffuse sclerosis participants, individuals with limited sclerosis

were less likely to engage in strategies high in self-kindness and demonstrated the lowest levels of self-kindness and mindfulness of all participants. Lower reports by limited sclerosis participants of over-identifying with their experiences when compared with diffuse sclerosis participants, may be due to a slower onset of the disease for limited sclerosis participants, providing the individual with more time to adjust to diagnosis and generally less severe disease symptoms to manage than diffuse sclerosis participants. Limited sclerosis participants may also over-identify with their experiences due to engaging emotion regulation strategies low in self-kindness and mindfulness.

Mindfulness enables an individual to remain connected to and evaluate their current circumstances from an emotional distance, reducing immersion in the experience and providing the opportunity to observe thoughts and feelings as they occur with compassionate awareness and acceptance. Mindful self-kindness reduces negative emotions and provides a more positive emotion regulatory approach, based on kindness and understanding toward the self (Neff, 2003a; Neff et al., 2007), rather than an evaluative process (Neff, 2003a) (involving the threat mentality, that is likely to increase arousal; e.g., Gilbert, 2000) that is likely to increase the practice of over-identifying with one's experiences and may explain the lower levels of self-kindness and mindfulness reported by individuals with limited sclerosis .

Individuals with breast cancer were less likely to over-identify with their experiences than limited and diffuse sclerosis participants and more likely to engage in self-kindness and mindfulness than limited sclerosis participants. Breast cancer participants were also less likely to engage in the self-compassion strategy of self-kindness than diffuse sclerosis participants. Community individuals generally tended to exhibit higher scores on self-compassion than scleroderma participants and reported similar scores to breast cancer participants, with the exception of self-kindness that was higher for diffuse sclerosis participants. How an individual regulates their emotions may be an indicator of whether they

operate in the threat mentality or the self-soothing social mentality and may impact on the relationship the individual has with the self. Engaging in strategies low in self-kindness and mindfulness in times of stress or distress, may reduce an individual's ability to self-sooth and manage difficulties without over-identifying with them, a strategy likely to increase the stress experience and level of arousal.

Research suggests the first symptom of scleroderma (Raynaud's phenomenon) is associated with stress (Freedman & Ianni 1983), findings that are supported by results from the first study (greater experiences of stress were linked to scleroderma participants reporting an earlier diagnosis of Raynaud's phenomenon). Results from the first study also demonstrated that elevated levels of stress were experienced by scleroderma participants diagnosed with Raynaud's phenomenon when compared with non-Raynaud's/scleroderma participants. Findings for individuals diagnosed with limited sclerosis indicated the younger these individuals were diagnosed with Raynaud's phenomenon the more likely the utilization of emotion regulation strategies suppression and insecure dismissive attachment. These strategies suggest a pattern of avoidance when relating to self and others as a method of coping. Avoidant coping strategies likely to engage the threat mentality may influence physiological responses in times of stress, increasing the likelihood of exposure to the long term effects of the stress and possibly immune functioning associated with an earlier diagnosis of Raynaud's phenomenon. Individuals who utilize a dismissive style of relating tend to engage avoidance and distancing strategies to manage emotions associated with thoughts such as not believing they are worthy of care; strategies likely to increase physiological processes involving stress and immune responses (Mikalincer & Shaver, 2007).

Raynaud's phenomenon is a vascular disorder that involves constriction of blood vessels generally in the peripheral areas of the body; however, this condition can also affect internal organs (e.g., Baker & Denton, 2008). Emotional stress influences physiological

systems that are implicated in the constriction of blood vessels. Sympathetic activation of blood vessels, constriction of blood vessels and blood circulation are controlled by neural pathways that involve chemicals such as norepinephrine and epinephrine released during situations such as physical and emotional stress (Sumpio et al., 2002). Individuals with scleroderma who engage emotion regulation strategies low in self-soothing are likely to increase physiological responses involving the release of chemicals in the stress response.

Strategies lower in self-compassion may therefore result in the underutilization of the self-soothing social mentality and increase the experience of stress over prolonged periods of time, impacting on the immune system and an earlier onset of Raynaud's phenomenon in individual's diagnosed with limited sclerosis. Raynaud's phenomenon in individuals diagnosed with diffuse sclerosis generally tends to occur immediately preceding or at the time of onset of the inflammatory stage of this form of scleroderma (Smith & Kahaleh, 2008). Diffuse sclerosis participants tended to engage in greater use of self-compassion (self-kindness) than other participants, however this group was more likely to over-identify (low self-compassion) with their experiences than any of the other illness or community participants. Individuals with diffuse sclerosis who utilize the practice of over-identify with their experiences may have difficulty adapting to and attempting to manage the more rapid onset and greater symptomology (can affect a number of systems in the body) of their condition when compared with the other participants.

An earlier diagnosis of Raynaud's phenomenon in the first study was also associated with over-identifying (low self-compassion) strategies in individuals diagnosed with diffuse sclerosis. Over-identifying with ones experiences is likely to reduce the ability to calm the emotional response increasing arousal levels and possibly impacting on the immune system. As diffuse sclerosis participants were more likely than any of the other participants to engage in this emotion regulation strategy at greater levels, it is possible this strategy may influence

immune functioning and an earlier onset of the first symptom (Raynaud's) of this disease; findings that are consistent with the first study.

Differences between the disease groups and community participants may indicate that stress, in the form of how an individual relates to the self in times of difficulty, may result in individuals with limited sclerosis remaining in chronic states of threat, due to a reduced capacity to self-sooth when compared with other participants in this study. The underutilization of emotion regulation strategies such as self-compassion and the practice of over-identifying with experiences in times of stress, may therefore increase the likelihood of an individual engaging the threat system on a regular basis for prolonged periods of time, heightening arousal levels and impacting on immune processes that may be associated with the onset of the first symptom of limited sclerosis. Continuing to use these threat related strategies may therefore place an individual in chronic states of fight and flight over a long time frame, further impacting on the immune system and perhaps the progression to the next stage of the disease that may take up to decades to occur.

While diffuse sclerosis participants tended to engage in greater use of self-kindness, their practice of over-identifying with their experiences may be partially explained by difficulties experienced adapting to and attempting to manage the more rapid onset and greater symptomology of their condition when compared with the other groups. This experience; however, may also involve over-identifying with other emotional experiences not related to the emotional and physical aspects of managing the symptoms of diffuse sclerosis.

Findings in the first study demonstrated that over-identifying with emotional experiences, were strategies likely to increase physiological arousal and possibly influence immune functioning, factors that were related to an earlier onset of Raynaud's for diffuse (and limited) sclerosis participants; suggesting these participants engaged in this style of thinking before onset of the disease. This way of thinking may therefore impact on immune

functioning, an earlier onset of scleroderma and possibly the disease course. Both diffuse and limited sclerosis participants were more likely to engage in strategies lower in self-compassion than breast cancer and community participants, (with the exception of self-kindness for diffuse sclerosis) inadequate emotion regulation strategies that may be likely to impact on immune system functioning and the development or earlier onset of the two major forms of scleroderma.

Overall Findings: Scleroderma -Breast Cancer - Community

Psychosocial: Scleroderma - Diffuse - Limited - Breast Cancer - Community

Scleroderma - Lower EMWS and Self-Compassion: Overall findings demonstrated that scleroderma participants and in particular individuals with limited sclerosis have significantly different experiences from community and breast cancer participants in relation to their early life experiences and their capacity to be kind to themselves. Limited opportunities to develop the self-soothing social mentality due to early life experiences low in warmth and safety and a limited capacity to engage in self-compassion strategies may (for individuals with scleroderma) engage the threat system rather than the soothing system when stressed or distressed. This way of relating to the self may impact on the immune system and over time, initiate an autoimmune reaction.

The findings in this study further support the literature and Gilbert's social mentalities theory (e.g., 2000; 2002; 2012), that proposes early rearing experiences deficient in compassion are likely to impede the development of the self-soothing social mentality, a system that assists in the regulation of emotions when distressed. Individuals who tend to function in the threat mentality as a result of inadequate exposure to compassion experiences in early life, may experience situations as more threatening, than others with more positive nurturing experiences. These individuals may experience augmented physiological responses such as increased sympathetic nervous system activation (Campbell-Sills et al., 2006) and

immune dysregulation (Schore, 1994) as a consequence of developing a hyper-responsive threat processing system (Gilbert, 2007).

The literature suggests that early stress experiences may impact on an individual's ability to cope in stress situations and reduce arousal levels, impacting on the immune system and increasing the likelihood of an autoimmune response (Heit et al., 1999; Schore, 1994) that may contribute to the development of scleroderma. Living with a chronic and incurable disease and having few compassionate strategies to manage ones thinking, may exacerbate one's identification with experiences, particularly those associated with the negative aspects of this disease. These strategies may increase the individual's distress at a time when a well-developed soothing mentality (that would assist in the reduction of distress) may be more beneficial.

Mental Health: Scleroderma/Breast Cancer/Community

Scleroderma: Higher Levels of Depression and Anxiety: Findings for the hypothesis: that individuals with scleroderma and breast cancer would report higher levels of depression, anxiety and stress when compared with community individuals; demonstrated lower scores for community participants on depression, anxiety and stress. A higher percentage of scores for community participants were recorded within the normal range for these variables, when compared to illness participants; with almost double the percentage of community participants reporting anxiety scores within the normal range, when compared to illness participants. A higher percentage of community participants did not report elevated depression, anxiety and stress; indicating non-clinical levels of anxiety at twice the level of illness individuals. Illness participants reported greater scores for depression, anxiety and stress and twice the percentage of clinical levels of anxiety than community participants.

A higher percentage of individuals with scleroderma reported clinical levels of anxiety, depression and stress, when compared with breast cancer participants, with a greater

percentage of breast cancer participants reporting non-clinical scores for anxiety, depression and stress than scleroderma participants. Findings demonstrated that a greater percentage of individuals with scleroderma, reported clinical levels of depression, anxiety and stress when compared to breast cancer and community participants. When comparing illness and community participants, a greater percentage of individuals with illness reported clinical levels of depression, anxiety and stress with a higher percentage (twice that of community individuals) experiencing elevated anxiety.

Clinical findings were supported by statistical results comparing differences between illness and community participants. Significantly higher levels of anxiety and depression were reported by scleroderma and breast cancer participants when compared with community participants and significantly higher levels of depression were reported by scleroderma participants compared to community individuals. Higher levels of anxiety were experienced by individuals diagnosed with scleroderma when compared to those diagnosed with breast cancer, although these results did not reach significance. These findings suggest that individuals attempting to manage a chronic and/or potentially life threatening disease may experience elevated levels of depression, anxiety and stress, perhaps due to the uncertainty of their prognosis and an inability to utilize the self-soothing mentality to manage affect. Engaging the threat mentality may increase physiological and psychological symptoms such as depression and anxiety in individuals diagnosed with scleroderma and breast cancer.

A greater percentage of scleroderma participants reported clinical levels of depression, anxiety and stress than breast cancer participants, indicating that individuals with scleroderma may be more susceptible to psychopathology than breast cancer and community individuals. This may be partially explained by deficits in compassion consequential to lower early life experiences of warmth and safety. Individuals with limited early life experiences involving feeling safe and nurtured are less likely to be exposed to experiences of compassion and

kindness and subsequently are likely to exhibit an underdeveloped self-soothing social mentality (e.g., Gilbert, 2000). Therefore individuals with scleroderma may be more likely to engage the threat mentality (rather than engage in self-compassion) due to previous negative experiences, than breast cancer and community participants.

Comparison - Predictor Variables Mental Health: Scleroderma/Breast Cancer

Scleroderma: EMWS/Self-Compassion/Suppression/Hyper-arousal

Findings related to predictor variables for depression, anxiety and stress for breast cancer and scleroderma participants revealed a number of differences between groups. Experiences low in early memories of warmth and safety and low in self-compassion predicted depression for scleroderma participants. While a dismissive attachment style and low self-compassion predicted depression for breast cancer participants. Suppression was the only variable to predict anxiety for breast cancer participants, whereas early memories of warmth and safety, suppression, hyper-arousal and pain predicted anxiety in individuals diagnosed with scleroderma. Low self-compassion and elevated levels of hyper-arousal predicted stress in the scleroderma group, while there was an association between these variables for the breast cancer group, no variable was a unique predictor of stress. Therefore there were some similarities between scleroderma and breast cancer individuals for predictor variables for depression (low self-compassion) while EMWS (scleroderma) and dismissive attachment (breast cancer) also predicted depression.

For anxiety, suppression was the only common predictor variable for both groups, while early memories of warmth and safety (a predictor variable for self-compassion), hyper-arousal and pain also predicted anxiety in scleroderma participants. These results indicated that emotion regulation strategies low in self-compassion (predictor variables for self-compassion; elevated hyper-arousal for both groups as well as EMWS for scleroderma participants) in both illness groups predicted depression, while suppression was a common

predictor variable for both groups for anxiety. Differences occurred between the groups on the remaining predictor variables for depression (dismissive attachment style for the breast cancer group and early memories low in warmth and safety for the scleroderma group). Low self-compassion and elevated levels of hyper-arousal predicted stress in individuals diagnosed with scleroderma, while no variable was a unique predictor of stress for breast cancer participants.

Results indicated that although there were common predictor variables for depression and anxiety, differences also occurred between groups for the remaining variables that contributed to depression, anxiety and stress. As a large percentage of scleroderma participants experienced clinical levels of depression, anxiety and stress, individuals diagnosed with scleroderma may be more vulnerable to psychopathology than breast cancer and community participants. This may be partially explained by deficits in compassion consequential to lower early life experiences of warmth and safety and elevated levels of hyper-arousal. Individuals with limited early life experiences involving feeling safe and nurtured are less likely to be exposed to experiences of compassion and kindness and subsequently are likely to exhibit an underdeveloped self-soothing social mentality (e.g., Gilbert, 2000; 2012), that may elevate threat related arousal levels.

Individuals with scleroderma may therefore be more likely to engage the threat mentality due to previous negative experiences, than breast cancer participants who may experience depression due to their disease diagnosis; rather than perhaps underlying developmental factors, or community participants, who reported significantly greater levels of non-clinical depression. Depression has been associated with self-criticism; higher levels of self-criticism in previous studies were associated with higher levels of depression (Gilbert et al., 2006). Therefore the inability to be kind to ones-self when stressed or exposed to threat events such as a diagnosis of a disease (where the recipient must manage the constraints

imposed on the body as a consequence of the disease and the fear associated with a poor prognosis) by engaging in strategies low in self-compassion, may exacerbate experiences of depression and therefore the development of a more depressive view of the disease course, for both scleroderma and breast cancer participants.

How participants develop their emotion regulation strategies appears to vary between illness groups. Scleroderma participant's early life experiences, low in warmth and safeness may have impacted on their levels of self-compassion, whereas breast cancer participant's dismissive way of relating to attachment figures may influence how they relate to themselves; i.e., with or without compassion and whether they engage the assistance of significant others for support as external emotion regulators in times of stress/distress. Dismissively attached (breast cancer) individuals are likely to demonstrate avoidant behaviours that reflect difficulties in relying on others and developing feelings of closeness to significant others (as identified by Mikulincer & Shaver, 2007). These individual's generally view themselves positively and exhibit independent behaviours, however they engage in avoidance and distancing due to uncertainty of others willingness to support then in times of need (Simpson & Rholes, 1998), a strategy that may create hyper-arousal in relatively minor situations (Van der Kolk & Greenberg 1987).

Breast cancer participants who engage these strategies may therefore be less likely to employ the self-soothing social mentality and engage significant others in a manner that engenders support. This strategy reduces the likelihood of accessing external emotion regulation resources that may provide soothing experiences when distressed and opportunities for the individual to reduce arousal and feel safe and secure. Employing strategies such as a dismissive style of relating and engaging in low-self compassion are negative ways of relating to the self and others likely to engage the threat mentality, and in this study increased breast cancer participant's experience of depression.

Suppression was a common predictor variable for anxiety for both scleroderma and breast cancer participants and may be utilized as an emotion regulation strategy to avoid fearful cognitions or emotions involving the adapting to and managing disease symptoms. Early life experiences low in warmth and safety as well as hyper-arousal and pain also predicted anxiety in individuals with scleroderma. This suggests these individuals were more likely to operate in the threat mentality as a result of limited early life experiences of feeling safe and nurtured and this may reduce their ability to operate in the self-soothing mentality, increasing their experience of anxiety. Therefore individuals with scleroderma who operate in the threat mentality as a result of experiencing limited nurturing and opportunities to feel safe in their childhood, may experience heightened states of arousal likely to impact on pain levels associated with their disease and elevated anxiety levels.

Scleroderma participants were also likely to suppress emotions, cognitions, memories or experiences that create distress as a strategy to regulate their emotions. This approach however is also likely to increase arousal levels and elevate anxiety. Living with a disease may elevate an individual's experience of anxiety and depression. Fear associated with disease symptoms and no known cure may engage feelings of helplessness and hopelessness associated with depression. These results suggest that thoughts associated with managing a disease are likely to impact on an individual, irrespective of the type of disease an individual suffers.

Low self-compassion and elevated levels of hyper-arousal predicted stress in individuals diagnosed with scleroderma, further demonstrating the likelihood that scleroderma participants were more likely to generate elevated levels of arousal when stressed, possibly due to engaging the threat mentality as a result of under-developed emotion regulation strategies in self-compassion. The utilization of strategies low in self-compassion, are likely to reduce the ability to self-sooth and reduce arousal levels, strategies likely to

increase the experience of stress in this study. Therefore the underdevelopment of the self-soothing social mentality as a result of early threatening environments (that fail to provide feelings of safeness and warmth) likely to over-activate the threat mentality (e.g., Gilbert, 2000; Gilbert, 2012), may impact on individuals experiences of depression, anxiety and stress in the current study.

The greater an individual's lack of positive early life experiences and the more an individual engages in emotion regulation strategies that involve avoidance or a negative way of relating to the self or others (that does not engage the self-soothing social mentality), the greater the likelihood an individual with scleroderma or breast cancer may engage negative cognitions and emotions associated with the threat mentality. This way of relating may elevate arousal levels associated with threat processing, the fight and flight response and physiological processes associated with immune dysregulation.

These threat experiences are therefore likely to impact on the individual with scleroderma and breast cancer's psychological wellbeing and capacity to manage a disease prognosis. The findings in this illness population are consistent with Gilbert and colleagues findings (2008; in a non-illness study) and add to the literature that suggest feeling safe and content and engaging in self-compassion strategies has a significant negative correlation with depression, stress, and an insecure attachment style (Gilbert et al., 2008; Neff et al., 2007) and also impacts on pain associated with disease symptoms in individuals diagnosed with scleroderma, as found in the current study.

Comparison: Pain - Scleroderma/Breast Cancer

Scleroderma: EMWS/Dismissive Attachment: Findings for pain in the total illness group (scleroderma and breast cancer) demonstrated that early life experience low in warmth and safety and a dismissive style of relating predicted pain. When the scleroderma and breast cancer groups were explored separately, early life experience low in warmth and safety and a

dismissive attachment style were significant unique predictors of pain experienced by individuals diagnosed with scleroderma. While neither variable predicted pain in breast cancer participants. These findings suggest that negative nurturing experiences associated with not feeling safe and cared for and an insecure dismissive attachment style, predict elevated levels of pain associated with scleroderma and are factors likely to engage the fight and flight response as a result of engaging the threat mentality. These variables however did not predict pain for breast cancer participants, suggesting that scleroderma participants were more likely to engage the threat mentality perhaps due to an in ability to self-sooth that may increase the experience of pain, than individuals diagnosed with breast cancer.

Breast Cancer Symptoms: Mental Health/Psychosocial

Fatigue - Depression: Findings for depression, anxiety and stress and breast cancer symptoms nausea and fatigue, demonstrated that fatigue was the only disease variable to predict depression, no other variable was significant for anxiety or stress; therefore breast cancer participants who reported elevated levels of fatigue were likely to experience higher levels of depression. Individuals were therefore more likely to experience greater levels of fatigue when depression was more severe.

Fatigue - Hyper-arousal: Findings for breast cancer participants for fatigue and nausea and psychosocial variables demonstrated that hyper-arousal was the only variable that predicted fatigue (no psychosocial variable predicted nausea); therefore breast cancer participants who experienced higher levels of hyper-arousal were more likely to experience elevated fatigue. Hyper-arousal may result from a number of factors including a heightened physiological stress response (Freedman & Ianni, 1983) or psychological stress involving the threat mentality, such as fear associated with a diagnosis of breast cancer or a fearful style of relating, a variable that was significantly associated with fatigue (but did not reach significance as a predictor variable) and significantly higher in breast cancer participants than

scleroderma participants. Feeling fearful and avoiding support from significant others in times of distress, may engage the threat system and increase levels of physiological arousal that may impact on the immune system and individuals with breast cancer experience of fatigue and depression.

Age Diagnosed with Scleroderma/Breast Cancer

Scleroderma: Hyper-arousal - Breast Cancer: Self-Compassion: Findings for age diagnosed with an illness (breast cancer or scleroderma) for the total illness group demonstrated that low self-compassion and elevated hyper-arousal were significantly related to age diagnosed with an illness; however neither variable significantly predicted age diagnosed with an illness. When analysis for the illness groups was conducted independently, higher experiences of self-compassion predicted a diagnosis of breast cancer at an older age, while elevated levels of hyper-arousal predicted a diagnosis of scleroderma at a younger age. These findings demonstrate differences between the illness groups for aspects that are likely to contribute to an earlier onset of scleroderma and a later onset of breast cancer.

Elevated experiences of hyper-arousal may result from an individual operating in the threat mentality due to a limited capacity to engage the self-soothing mentality and return the body to a state of homeostasis. Scleroderma participants who experienced elevated and perhaps chronic states of hyper-arousal were more likely to report an earlier onset of scleroderma; whereas breast cancer participants who employed self-compassion strategies were more likely to experience a later onset of breast cancer. The utilization of self-compassion a strategy likely to engage the self-soothing social mentality to manage emotions and reduce the threat experience (this assumption is supported by the significant relationship between self-compassion and hyper-arousal; with greater self-compassion predicting lower levels of hyper-arousal), may possibly decrease arousal and return the individual with breast cancer's body to a state of equilibrium.

These findings suggest that self-compassion is a powerful strategy for managing an individual's emotions and effectively reducing the experience of threat, arousal levels and the effect on the immune system in a manner that appears to delay the onset of breast cancer. This suggests that individuals who are likely to experience breast cancer may delay the onset of this disease by engaging in strategies high in self-compassion. It is therefore possible that negative early life experiences and the development of certain cognitions and emotions that are low in self-compassion are likely to increase arousal levels and subsequently impact on the immune system; and may partially contribute to the development or earlier onset of scleroderma. Breast cancer participants when compared to scleroderma participants did not report significant results for negative early life experiences and reported more positive outcomes due to engaging in self-compassion (e.g., a later diagnosis of breast cancer).

Conclusion: Differences between Groups

In conclusion findings suggest difference between groups on a number of variables, with all variables under investigation significantly related to or predicting dependant variables; partially supporting the hypotheses. Results suggest that differences between groups may be related to early life experiences of stress/threat and the individual's capacity to engage inter-personal and intra-personal resources to manage stress/distress and reduce the impact of negative events. Early life experiences that provide limited experiences of warmth and feelings associated with safety may impact on an individual's subjective evaluation of stress/threat experiences, the capacity to self-sooth and to rely on others as emotion regulators. These negative rearing experiences may subsequently reflect a reliance on inadequate resources such as suppressing emotions and strategies low in self-compassion that may impact on the level and duration of arousal or hyper-arousal, an individual experiences throughout the lifespan. Hyper-arousal in the current study was related to scleroderma symptomology and lower self-compassion and may be a consequence of negative early

rearing experiences, lacking adequate opportunities to feel safe and calm.

Scleroderma participants were more likely to report less childhood memories of warmth and safety and lower self-compassion (over-identification, self-kindness and mindfulness) than community participants. Scleroderma participants were also more likely to over-identify with their experiences than breast cancer participants and less likely to experience an insecure fearful attachment style than breast cancer participants. Breast cancer participants demonstrated similar levels of self-kindness and over-identification with their experiences when compared with community individuals. Scleroderma participants therefore have significantly different experiences than community participants in relation to their early life experiences and significantly different experiences than community and breast cancer participants in their capacity to be kind to themselves; however, breast cancer participants were more likely to experience a fearful attachment style than scleroderma participants.

Difference between groups demonstrated that negative rearing experiences that are likely to impact on the development of self-compassionate emotion regulation strategies and impede the development of the self-soothing social mentality were greater in scleroderma participants than community participants. Breast cancer participants were more likely to experience a fearful style of relating to significant others than scleroderma participants; a way of relating that for some individuals with breast cancer may also have developed in childhood. This strategy may as a consequence of developing breast cancer, create further insecurity in intimate relationships as a result of negative perceptions around reliance on others at a time when seeking support from a significant other may be beneficial; in that it provides opportunities to reduce arousal and increase feelings of safety and security.

Higher levels of self-compassion were predicted by lower experiences of arousal for individuals diagnosed with breast cancer, while lower engagement in self-compassion and limited early life experiences of warmth and safety predicted elevated hyper-arousal in

individuals diagnosed with scleroderma. These predictor variables may further explain the issues that underlie the experiences explored in this study that involve limited experiences of feeling safe and secure in childhood and the under-development of self-compassion, an emotion regulation strategy likely to increase the engagement of the threat mentality, levels of arousal and dysregulation of the immune system.

A higher percentage of scleroderma participants reported clinical levels of anxiety, depression and stress when compared to breast cancer participants, with a greater percentage of breast cancer participants reporting non-clinical scores for anxiety, depression and stress than scleroderma participants. Clinical findings were supported by statistical results comparing differences between illness and community participants. Similarities were found between scleroderma and breast cancer individuals for the predictor variable low self-compassion for depression, while EMWS (scleroderma) and dismissive attachment (breast cancer) also predicted depression for the respective groups. Suppression was the only common predictor variable for both groups for anxiety and the only significant variable for breast cancer. While early memories low in warmth and safety, hyper-arousal and pain also predicted anxiety in scleroderma participants. Low self-compassion and elevated levels of hyper-arousal predicted stress in individuals diagnosed with scleroderma, while no variable predicting stress for breast cancer participants. Findings indicated that although there were common predictor variables for depression (self-compassion) and anxiety (suppression), differences also occurred between groups for the remaining variables, with EMWS, self-compassion, hyper-arousal and pain predicting the dependent variables for scleroderma participants.

Findings also demonstrated early life experiences low in warmth and safety and a dismissive attachment style predicted pain for scleroderma participants; however, no variable predicted pain in breast cancer participants; indicating difference between groups for

experiences that predict elevated levels of pain. Scleroderma participants negative early life experiences appear not only to impact on their levels of depression and anxiety but also effect pain related aspects of this disease, whereas these early life experiences and the variables they predict were not shared by individuals diagnosed with breast cancer. Breast cancer participant's low experiences of self-compassion however predicted depression, along with an insecure dismissive attachment style. This way of relating to others may also be learnt in early childhood (Schore, 1994) and involves the utilization of avoidant behaviours low in self-compassion. These strategies reflect distancing and difficulty relying on significant others for support and soothing in times of need (Mikulincer & Shaver, 2007; Simpson & Rholes, 1998). A way of relating that is also likely to engage the threat mentality (e.g., Van der Kolk & Greenberg 1987; Gilbert, 2000; 2012) and reduce opportunities to manage arousal levels and feel safe and secure.

Lower experiences of self-compassion and elevated hyper-arousal also predicted stress in scleroderma participants, suggesting that stress experiences were also related to operating in the threat mentality, resulting from using strategies that indicate limited opportunities to develop and utilize emotion regulation strategies high in self-compassion. Strategies likely to reduce arousal levels (this argument is supported by the statistical significant predictor variables for low self-compassion for scleroderma participants; elevated hyper-arousal and limited experiences of warm and safety as a child) and the experience of stress. Scleroderma and breast cancer participants also demonstrated differences in predictor variables for age diagnosed with these respective conditions. Higher experiences of self-compassion predicted a later diagnosis of breast cancer, while elevated experiences of hyper-arousal predicted an earlier onset of scleroderma. Therefore early life experiences that provide opportunities to development the self-soothing social mentality through the use of emotion regulation strategies that promote self-compassion and a secure attachment style are likely to be

associated with lower arousal levels and more beneficial physical and psychological health outcomes.

Scleroderma - Greater Negative Psychosocial Experiences: Individuals with scleroderma appear to suffer greater levels of psychopathology when compared with breast cancer and community participants in this study. These findings may be due to greater early life experiences deficit in warmth and safety, a situation likely to increase fear and threat factors associated with the threat mentality and elevated levels of arousal, associated with physical, psychological and social factors in this study. Scleroderma and breast cancer participants who engaged in negative ways of relating to self (low self-compassion) and others (dismissive attachment style) were more likely to report greater psychological distress and therefore more likely to engage the threat mentality. As greater levels of self-compassion predicted a later onset of breast cancer and greater levels of hyper-arousal predicted an earlier diagnosis of scleroderma, it is likely that engaging in self-compassion strategies that involve a well-developed self-soothing social mentality rather than the threat mentality may predict better outcomes for individual experiences, of disease related symptoms and psychological well-being.

In conclusion, the absence of compassionate soothing experiences and the internalisation of early external threat (early life experiences low in warmth and safety) may impede the development of the self-soothing social mentality and lead to an inability to use effective strategies for regulating the emotional response to stress or distress. The development and utilization of strategies that involve self-compassion and reliance on attachment figures to promote emotional and subsequently physiological calming responses may be beneficial to individuals with scleroderma and breast cancer in relation to emotional and physical health.

Engaging defensive strategies such as suppression and a dismissive style of relating to

avoid internal and external threat experiences may reduce the ability to engage in self-kindness and may reduce the capacity to draw on compassionate resources and subsequently increase an individual with scleroderma's susceptibility to conditions such as depression, anxiety and stress and physiological responses, that increase sympathetic nervous system activation (hyper-arousal) and create immune dysregulation; experiences that may explain an earlier onset of scleroderma. While a greater capacity to engage in self-compassion as an effective emotion regulation strategy to reduce arousal and return the body to homeostasis may contribute to a later diagnosis of breast cancer.

Findings suggest that different psychosocial stressors may indicate different symptom responding in different illness populations and therefore the need to identify how different stressors may impact on a range of different diseases. The implications for stress reduction and psychological treatments based on common stressors in each of the illness populations may prove helpful in treating patients with physical illness through the utilisation of psychological therapies.

Limitations

The recruitment of a larger sample of breast cancer participants for this research project was difficult to gain due to breast cancer organisations concerns about exploring members early childhood experiences, due to factors related to blame for the development of the disease. Therefore low participant numbers in relation to number of variables and analysis in this study is a limitation. Post-hoc power calculations were therefore conducted to ensure adequate power. Calculations for significant findings except pain in the total illness sample indicated adequate power. The pattern resulting from all findings in both illness groups indicated a link between early life experiences (scleroderma) and insecure attachment styles (scleroderma and breast cancer) and inadequate emotional strategies that are likely to engage the threat mentality, the threat response and possibly impact on immune functioning.

A pilot study was originally planned for the third study for this research project. This study was to involve conducting compassion focused therapy for scleroderma participants based on the findings of the first two studies. During the confirmation process the committee decided that the third study should not involve a pilot study but a comparison of a different disease population, to identify whether differences between community individuals and individuals with scleroderma were unique to that population, or whether there were similarities or differences between illness groups. Breast cancer was selected as the comparison disease as it has a high prevalence in women and because it was not an autoimmune disease; therefore different biological processes were involved in the disease course.

Collection of data for the first two studies was in progress at the time of this change therefore a question indicating whether participants in the community sample had experienced breast cancer was not included in the original survey as at this time, the breast cancer question was not relevant to the study. The omission of this question was not realised until all data had been collected. Therefore it is possible that some of the participants from the community sample may have been diagnosed with breast cancer at some stage in their life and that these participants have been included in the second comparison study (third study) as community participants when in fact they should have been included in the breast cancer group or excluded from the study. Results for the hypothesis involving the comparison between the breast cancer and community participants must therefore be viewed with caution as the similarities in some of the results may be due to measuring participants in the community group who have experienced breast cancer. However as prevalence rates of breast cancer in general community samples are one in eight (AIHW, 2013), it is likely that from a sample in this study the number of participants that may have had breast cancer would possibly be as low as two and as high as three, a figure that may not impact on the statistical

significance of the results. The self-report rating scale used to measure EMWS is also a limitation as it is reliant onf recall of early life experiences which may be subject to memory bias.

CHAPTER 6 - THE THESIS PROJECT IN REVIEW

General Discussion of Research Findings from the Three Studies

Regulation Predicts Physiological and Psychological Health Outcomes

Purpose of the Studies: This series of studies set out to find whether adverse childhood experiences, insecure attachment behaviours (interpersonal) and emotional and cognitive strategies (intrapersonal) that increase arousal (hyper-arousal) and physiological responses were involved in the exacerbation or earlier onset of scleroderma symptoms. Levels of arousal were examined in 1983 (Freedman & Ianni) and have not been examined since that time. This research suggested that individuals with scleroderma and Raynaud's responded with greater physiological arousal than individuals diagnosed with Raynaud's, without scleroderma. Research identifying the factors that may contribute to this stress response have not been previously investigated. A number of scleroderma studies have investigated mental health and disease related psychosocial variables (e.g., Angelopoulos et al., 2001; Roca et al., 1996; Thombs et al., 2008); however, these studies did not explore these variables from a stress-arousal-disease symptoms and onset perspective.

The current research project therefore examined factors reported in the literature as related to arousal and the threat/stress response, to provide an understanding of psychosocial factors that may contribute to an elevated physiological response and the exacerbation and/or onset of scleroderma symptoms. The study also explored the benefits of engaging in self-compassion in relation to levels of arousal, psychosocial experiences and scleroderma symptoms and onset.

Discussion

The findings in the current study provide some insight into the link between psychosocial factors that involve interpersonal (such as EMWS and attachment style) and intrapersonal (such as self-compassion) relationships, physiological responding such as hyper-arousal and the onset and exacerbation of scleroderma symptoms. These factors were explored through the investigation of variables that predicted symptoms (illness related/ psychosocial/mental health) and two studies, comparing psychosocial and mental health symptoms in individuals from a general community sample and psychosocial symptoms and pain in individuals diagnosed with breast cancer, to determine differences in experiences and the influence these different experiences may have on psychological and physical health. These aspects were expected to be more severe in those with scleroderma when compared with the two groups.

The purpose of the current study was to inform treatment by providing further understanding around the implications of utilizing strategies that increase arousal and impact on physical and psychological health. That is to emphasise the importance of engaging individuals in effective emotion regulation strategies such as self-compassion to reduce arousal and improve psychological and physical health outcomes.

Scleroderma: Interpersonal/Intrapersonal Experiences: Results for the three studies suggested scleroderma symptoms were associated with and predicted by a number of psychosocial variables linked to elevated physical reactions and immune related responses that may have developed in early childhood. Childhood experiences for low warmth and safety predicted elevated scleroderma related pain, and Raynaud's phenomenon and were associated with skin severity. Mental health factors (depression and anxiety) were experienced by more scleroderma participants at greater clinical levels than breast cancer and community participants. These factors were also predicted by limited early life experiences of

warmth and safety. Having low self-compassion for oneself was also a significant factor in predicting problems of depression (for both scleroderma and breast cancer participants) and in a diagnosis of breast cancer at a younger age. Elevated stress was associated with limited childhood experiences of warmth and safety in individuals with scleroderma. Scleroderma participants' experiences of warmth and safety (EMWS) were significantly lower than those experienced by community participants. However EMWS did not predict any variable for individuals diagnosed with breast cancer.

Insecure attachment variables, dismissive and fearful attachment styles reflect ways of relating to significant others that may also have developed in early childhood. These aspects were also significant for several physical and psychological factors in both breast cancer and scleroderma participants. Individuals diagnosed with limited sclerosis reporting a greater tendency to engage in a dismissive attachment style, were more likely to have experienced an earlier onset of Raynaud's phenomenon. The first symptom of scleroderma is Raynaud's phenomenon, which is often diagnosed in individuals with limited sclerosis, up to decades before the onset of the inflammatory stage of scleroderma. These findings suggest that the way an individual relates to significant others may impact on an earlier (for insecure attachment style) onset of disease symptoms (Raynaud's phenomenon).

Emotion regulation strategies of suppression and low self-compassion predicted scleroderma symptoms and psychosocial variables for both scleroderma and breast cancer participants. Limited self-compassion was predicted by limited experiences of warmth and safety and by elevated hyper-arousal for scleroderma participants. Hyper-arousal predicted elevated Raynaud's phenomenon and scleroderma disability. This variable (hyper-arousal) also predicted an earlier diagnosis of scleroderma. Lower self-compassion was predicted by hyper-arousal in breast cancer participants; while hyper-arousal predicted fatigue related to breast cancer and was associated with nausea.

Findings suggest that individuals with scleroderma experienced heightened states of arousal that are associated with a number of physiological and psychological factors. These individuals reported lower early life experience of warmth and safety than community and breast cancer (not significant) participants. These findings may explain the difference in predictor variables for hyper-arousal for breast cancer and scleroderma participants. Lower self-compassion predicted elevated hyper-arousal in scleroderma and breast cancer participants, suggesting that these emotion regulation strategies were likely to increase physiological responses to threat that increase arousal levels. Breast cancer participants who engaged in strategies high in self-compassion reported experiencing breast cancer at an older age, indicating more positive physiological outcomes for individuals diagnosed with breast cancer who engaged in self-compassion.

There were no positive outcomes between self-compassion and scleroderma. Significantly lower experiences of self-compassion, EMWS, insecure attachment, and significantly elevated levels of suppression and hyper-arousal tended to indicate more negative illness related and psychological health outcomes for scleroderma participants; whereas significant variables insecure attachment, low self-compassion and suppression predicted negative psychological outcomes and hyper-arousal predicted negative physical (elevated fatigue) outcomes for breast cancer participants.

The findings support Gilbert's Social Mentalities theory, in that individuals with scleroderma were likely to engage in emotion regulation strategies that increased arousal. This inadequate approach to managing negative emotions and reducing arousal may have developed as a consequence of being exposed to early social experiences limited in nurturing and feelings around safety and security. These experiences may have also contributed to the development of an insecure attachment style that predicted an early onset of Raynaud's phenomenon (the first symptom of scleroderma diagnosed up to decades before the onset of scleroderma, in

individuals with limited sclerosis). Findings suggest that scleroderma participants may engage the threat mentality due to limited early social experiences of soothing (under-developed self-soothing mentality), necessary to develop effective emotion regulation strategies such as self-compassion. These inadequate emotion regulation strategies that generally do not reduce arousal and the subsequent social behaviours (insecurity in attachment relationships) may explain more negative health outcomes for scleroderma participants, when compared with individuals experiencing breast cancer.

Individuals with scleroderma and individuals with breast cancer who engaged strategies low in self-compassion and/or fail to rely on significant others in times of distress, may be likely to increase physiological arousal through the activation of avoidance behaviours, such as utilizing a dismissive style of relating or through suppressing distressing emotions, or over-identifying with negative experiences (variables found to be higher in scleroderma participants than breast cancer and community participants). Actions that may influence negative psychological and physiological health comes. An earlier onset of scleroderma was predicted by hyper-arousal, while lower experiences of self-compassion were significantly related to elevated hyper-arousal for both scleroderma and breast cancer individuals. Therefore the under-utilization of effective emotion regulation strategies, such as being open to one's experiences without over-identifying, suppressing or avoiding, through the use of compassionate mindful awareness; may reduce the capacity of individuals with scleroderma or breast cancer to self-sooth and reduce arousal levels; returning the body to a state of equilibrium, and subsequently lessening

the impact on the immune system.

Findings suggest that the utilization of a well-developed self-soothing social mentality through the engagement of self-compassion strategies may reduce arousal and provide better health outcomes; in that individuals with breast cancer in the third study reporting higher self-

compassion experienced breast cancer at an older age. Therefore a well-developed self-soothing social mentality that provides opportunities to utilize strategies high in self-compassion and engage support and care from significant others, may reduce arousal and the impact on immune system functioning. The capacity to engage in these strategies may explain the different outcomes experienced by breast cancer and scleroderma participants. Breast cancer participant's self-compassion may provide beneficial outcomes in that it predicts a diagnosis of breast cancer at a later age. This suggests that engaging in strategies that are high in self-compassion may effectively reduce physiological arousal when stressed or distressed, delaying the onset of disease.

Conclusion: The findings support the psychosocial scleroderma model proposed earlier in this research project, that suggests early environments that involve a lack of warmth and safeness, influence the development of the threat mentality (e.g., Gilbert et al., 2006), inadequate emotion regulation strategies (such as suppression and low self-compassion) and insecure attachment styles (dismissive and fearful); ways of relating to the self and others that are likely to be inadequate in reducing arousal and are risk factors in the development of psychological disorders (depression and anxiety) and hyper-arousal associated with an earlier onset of scleroderma. Engaging in strategies high in self-compassion appears to provide protective mechanisms for down regulating the stress/threat response (levels of hyper-arousal); as found in the third study with individuals diagnosed with breast cancer. In this study individuals who engaged in higher levels of self-compassion reported a diagnosis of breast cancer at an older age. Whereas low self-compassion was related to a diagnosis of Raynaud's phenomenon at a younger age for individuals diagnosed with scleroderma in the first study. Suggesting that this way of relating to self has negative consequence as it is linked to an earlier onset of Raynaud's, the first symptom of scleroderma. As low-self compassion was also related to hyper-arousal (hyper-arousal predicted a diagnosis of scleroderma at a

younger age) and a number of psychological (e.g., depression and stress) and scleroderma symptoms (e.g., Raynaud's phenomenon); providing education and treatment in the development of self-compassion, may enable individuals with scleroderma and breast cancer to engage in more effective emotion regulation strategies, to reduce arousal and improve psychological and physical disease symptomology.

Implications and Recommendations

As genetic and environmental factors are well known risks in the development of many diseases; experiencing early environments that provide limited experiences of feeling nurtured and safe are likely to create distress and physiological arousal associated with the threat system and the development of the threat mentality. Parents who fail to provide their children with opportunities to develop emotion regulation strategies, involved in the self-soothing social mentality and associated resources to seek help from others (as external regulators); may leave their children vulnerable to more negative health outcomes in later life. Utilizing emotion regulation strategies that reduce arousal and the impact on the immune system may provide opportunities to delay the onset of a disease an individual may otherwise be predisposed to.

Engaging in effective emotion regulation strategies such as self-compassion would not only provide personal benefits to the individual but financial benefits to the health system. A delay in onset may lessen the burden on families as children would be older and therefore the illness would be less likely to impact on the responsibilities associated with caring for a young family, managing a career and general life activities associated with these factors. Individuals with incurable diseases would have a better quality of life for a longer period of time (having the disease later in life) and would most likely require fewer visits for medical treatment, than if diagnosed with the illness at a younger age. The benefits of engaging in self-compassionate emotion regulation strategies would therefore provide advantages not only for the individual

inflicted by the disease and their family but would also reduce the financial cost to the health system and the general community. Providing opportunities for individuals diagnosed with scleroderma and breast cancer (by providing information about this study to scleroderma patients through Scleroderma association's newsletters and publications for psychologist about the relevance of the significant variables to specific symptomology and onset found in this study) to develop self-compassion strategies to effectively manage emotions and reduce arousal. Psychologist with an understanding of the findings in this study would become more aware of screening for negative childhood experiences of threat, levels of self-compassion and emotion regulation strategies such as suppression and physiological experiences of hyper-arousal to inform treatment. As a great number of people with scleroderma are members of Scleroderma associations the development of strategies to manage the experiences reported in the current study could be delivered in either a group or individually setting, in order to deliver information and strategies to a greater number of people more quickly through these associations and possibly improve current psychological and scleroderma symptoms and improve quality of life.

Breast cancer and scleroderma participants may benefit from education around the implications of engaging in adequate emotion regulation strategies that provide positive soothing experiences to reduce emotional distress and physically calm the body. These individuals may also benefit from information about reducing the fight and flight response and the consequential chronic states of arousal that impede the functioning of the immune system. Compassion focused therapies and emotion regulation strategies that provide opportunities to develop the self-soothing social mentality would also assist individuals with scleroderma and breast cancer.

Improving understanding that some coping styles are not helpful in reducing physiological and psychologically stress and providing individuals with opportunities to

become mindfully aware of difficult thoughts and memories without using over-identification or suppression techniques; while managing these experiences with self-kindness, rather than self-judgment would almost certainly assist many individuals with scleroderma and breasts cancer to live more healthier, happier, less painful and more relaxed lives than may otherwise occur, without the opportunity to improve the relationship with one's self.

General community health outcomes may also improve if education were available to the public (perhaps through literature resources and health programs on television) that informed parents and caregivers of the psychological and physiological health implications of providing, or not providing children opportunities to develop emotion regulation strategies that facilitate self-soothing thinking processes. Parents therefore would become more aware of the impacts these experiences may have on their children and implement more appropriate parenting strategies that reduce distress and arousal and provide a greater likelihood of positively influencing the future health of their children.

Future Research

The current study forms the basis for future research. Individuals diagnosed with Raynaud's disease could be assessed for emotion regulation strategies (such as low self-compassion) and other stress related factors that create hyper-arousal. Individuals would be offered compassion focused therapy and monitored for development of scleroderma. Participants would be compared to individuals that elected not to engage in therapy. This study may identify potential risk factors in the development of scleroderma; and a therapy that may increase the age of onset or provide possible preventative outcomes. For those individuals with a current diagnosis of scleroderma and breast cancer, research that involves interviewing this population regarding their childhood history and engaging these groups in emotion regulation strategies such as self-compassion and reduction in emotional suppression to reduce negative arousal may provide opportunities to improve psychological and physiological disease related

health outcomes. Research involving other autoimmune diseases (as well as scleroderma) with a larger sample size could also be conducted (in Australia, the USA and UK) to determine whether similar experiences are reported by these populations; and whether these experiences are related to onset and severity of disease symptoms. If future research exploring these populations, report similar findings, a treatment model could be formulated for individuals experiencing stress related arousal associated with elevated symptomology; to improve psychological and physiological well-being.

Final Note

For parents with young children: engaging in activities that encourage feelings of warmth and safety to reduce distress and arousal could help reduce the occurrence and experience of pain, associated with some of our more serious illnesses such as scleroderma. For those in psychological practice: this research (scleroderma and scleroderma/breast cancer models) may provide guidelines to assist clients who have negative early life experiences and suffer a disease in later life. Assessing clients' experiences of compassion (self and others) and emotion regulation strategies (involving arousal and immune system functioning); and engaging clients in therapies that address these problems, may provide dramatically improved physiological and psychological outcomes for these individuals.

References

Abercrombie, H. C., Giese-Davis, J., Sephton, S., Epel, E. S., Turner-Cobb, J. M., & Spiegel, D. (2004). Flattened cortisol rhythms in metastatic breast cancer patients. *Psychoneuroendocrinology, 29*(8), 1082-1092.

Ackerman, K. D., Heyman, R., Rabin, B. S., Anderson, B. P., Houck, P. R., Frank, E., & Baum, A. (2002). Stressful life events precede exacerbations of multiple sclerosis. *Psychosomatic Medicine, 64*(6), 916–920.

Ainsworth, M. D. (1985). Patterns of infant-mother attachments: antecedents and effects on development. *Bulletin of the New York Academy of Medicine, 61*(9), 771–791.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). *Washington DC:* Author.

Angelopoulos, N.V., Drosos, A. A., & Moutsopoulos, H. M. (2001). Psychiatric symptoms associated with scleroderma. *Psychotherapy and Psychosomatics, 70(3),* 145-150.

Arnett, F. C., Cho, M., Chatterjee, S., Aguilar, M. B., Reveille, J. D., & Mayes, M. D. (2001). Familial occurrence frequencies and relative risks for systemic sclerosis (scleroderma) in three United States cohorts. *Arthritis & Rheumatism*, *44*(6), 1359-1362.

Arnetz, B. B., & Ekman, R. (2006). *Stress in health and disease*. Germany: Wiley-VCH, Weinheim.

Assies, J., Vingerhoets, A. J., & Poppelaars, K. (1992). Psychosocial aspects of hyperprolactinemia. *Psychoneuroendocrinology, 17*(6), 673-679.

Australian government Cancer Australia**:** canceraustralia.nbocc.org.au/breast-cancer/ stages-of-breast-cancer**,** retrieved 30/1/2012.

Australian Institute of Health and Welfare (2013), Cancer survival and prevalence in Australia: Period estimates from 1982 to 2010. *Asia-Pacific Journal of Clinical*

Oncology, 9, 29-39.

Baker, D. M., & Denton, C., (2008). Vascular complications of systemic scleroisis: a molecular perspective. In D. Abraham, M. Dashwood, C. Handler and G. Coghlan (Eds). *Vascular complications in human disease* (pp 119-127). London: Springer.

Barlow, D. H., & Durand,V. M. (1999). *Abnormal psychology: an integrative approach,* (2nd ed.). Pacific Gove: Brooks/Cole Publisher.

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: a test of a four-category model. *Journal of Personality and Social Psychology, 61*(2), 236-244.

Benrud-Larson, L.M., Haythornthwaite, J.A., Heinberg, L. J., Boling, C., Reed, J., White, B., & Wigley., F.M. (2002). The impact of pain and symptoms of depression in scleroderma. *Pain, 95*(3), 267-275.

Beretta, L., Astori, S., Ferrerio, E., Caronni, M., & Scorza, R. (2006). Determinants of depression in 111 Italian patients with systemic sclerosis. *Reumatismo, 58*(3), 219.

Blask, D. E., Brainard, G. C., Dauchy, R. T., Hanifin, J. P., Davidson, L. K., Krause, J. A., & Zalatan, F. (2005). Melatonin-depleted blood from premenopausal women exposed to light at night stimulates growth of human breast cancer xenografts in nude rats. *Cancer Research, 65*(23), 11174-11184.

Bolster, M. B. & Silver, R. M. (2008). *Clinical features of systemic sclerosis.* In Hotchenbergm M. C. Silman A. J. Smollen J. S. Weinblatt M. E. & Weisman M. H. (Eds), Rheumatology (Vol. 2. 4th ed., pp. 1375-1384). London, UK: Mosby Elsevier.

Boscarino, J. A. (2004). Posttraumatic stress disorder and physical illness: results from clinical and epidemiologic studies. *Annals of the New York Academy of Sciences, 1032*(1), 141-153.

Bowlby, J. (1997). *Attachment and Loss: (Vol.1), Attachment.* London, U.K: Pimlico (Original work published in 1969).

Bowlby, J. (1998). *Attachment and Loss: (Vol. 2), Separation anger and anxiety.* London, UK: Pimlico. (Original work published in 1973.)

Brewin, C. R., Firth-Cozens, J., Furnham, A., & McManus, C. (1992). Self-criticism in adulthood and recalled childhood experience. *Journal of Abnormal Psychology, 101*(3), 561-566.

Briere, J., Elliot, D.M., Harris, & K., Cotman, A. (1995). Trauma symptom inventory: psychometrics and association with childhood and adult victimization in clinical samples. *Journal of Interpersonal Violence, 10*(4), 387-401.

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality, 54*: 106–148.

Brown M.J., Thacker, L.R., Cohen, S.A., (2013). Association between Adverse Childhood Experiences and Diagnosis of Cancer PLoS ONE 8(6): e65524. doi:10.1371/ journal.pone.0065524.

Burns, J. W. (2006). Arousal of negative emotions and symptom specific reactivity in chronic low back pain patients. *Emotion, 6,*309-319.

Bussone, G., & Mouthon, (2011). Interstitial lung disease in systemic sclerosis. *Autoimmune Review 10(5):*248-55.

Campbell-Sills, L., Barlow, D. H., Brown, & T. A., Hofmann, S.G. (2006). Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. *Behaviour Research and Therapy, 44*(9), 1251-1263.

Chapel, H., Haeney, M., Misbah, S., & Snowden, N. (2006). *Essentials of clinical immunology* (5th ed.). Malden, Massachusetts: Blackwell Publishing.

Chen, Y., Huang, J., Qiang, Y., Wang, J., & Han, M. (2008). *Journal of Zhejiang*

University: Science B, 9(11), 853-856.

Chifflot, H., Fautrel, B., Sordet, C., Chatelus, E., & Sibilia, J. (2008). Incidence and prevalence of systemic sclerosis: a systematic literature review. *In Seminars in Arthritis and Rheumatism* (Vol. 37, No. 4, pp. 223-235). WB Saunders.

Crawford, J. R. & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology, 42*(2), 111-131.

Crittenden, P. M., & Claussen, A. H. (2000). *The organization of attachment relationships: maturation, culture, and context.* New York: Cambridge University Press.

Cutolo, M., Capellino, S., Sulli, A., Serioli., B., Secchi, M. E., Villaggio, B., Straub R. H. (2006). Estrogens and autoimmune diseases. Annals of New York Academy of Science. 1089, 538-47.

Da Costa, D., Dobkin, P. L., Pinard, L, Fortin, P. R., Danoff, D. S., Esdaile, J. M., & Clarke, A. E. (1999). The role of stress in functional disability among women with systemic lupus erythematosus: a prospective study. *Arthritis Care Research, 12*(2), 112-119.

Davies, K. A., Macfarlane, G. J., McBeth, J., Morriss, R., & Dickens, C. (2009). Insecure attachment style is associated with chronic widespread pain. *Pain 143*(3), 200-205.

Depue, R. A., & Morrone-Strupinsky, J. V. (2005). A neurobehavioral model of affiliative bonding: Implications for conceptualizing a human trait of affiliation. *Behavioural and Brain Sciences, 28*(3), 313–349.

Dragkioti, E., Mavreas, V., Damigos, D., Kotrotsiou, E., & Gouva, M. (2011). The role of childhood traumatic events in fear of pain related behaviours in adulthood. *European Psychiatry, 26,* 1068.

Dube, S. R., Fairweather, D., Pearson, W., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic*

Medicine, 71(2), 243-250.

Eeles, R., Peto, J., & Stratton, M. (2004). CHEK2* 1100delC and susceptibility to breast cancer: a collaborative analysis involving 10,860 breast cancer cases and 9,065 controls from 10 studies. *American Journal of Human Genetics, 74*(6), 1175-1182.

Etkins, S., Lenker, D. P., & Mills, E. J. (2005). *Professional guide to diseases* (8th ed.). Ambler, PA: Lippincott, Williams & Wilkins.

Every, G. S., & Lating, J. M. (2002). The link from stress arousal to disease: In D. A. Meichenbaum (Ed.), *Clinical guide to treatment of the human stress response* (2nd ed.). New York, NY: Springer.

Fava, G. A., Fava, M., Kellner, R., Serafini, E., & Mastrogiacomo, I. (1981). Depression, hostility and anxiety in hyerprolactinemic amenorrhea. *Psychotherapy and Psychosomatic, 36*(2), 122-128.

Fava, M., Serafini, E., De Besi, L., Adami, A., & Mastrogiacomo, I. (1988). Hyperprolactinemia and psychological distress in women undergoing chronic hemodialysis. *Psychotherapy and Psychosomatics, 49*(1), 6-9.

Ferrara, (2014). Child abuse and neglect: psychiatric and neuro-biological consequences. *Italian Journal of Paediatrics, 40,* 1-32

Finzi-Dottan, R., & Karu, T. (2006). From emotional abuse in childhood to psychopathology in adulthood: a path mediated by immature defense mechanisms and self-esteem. *The Journal of Nervous and Mental Disease, 194*(8), 616-621.

Freedman, R. R., & Ianni, P. (1983). Role of cold and emotional stress in Raynaud's disease and scleroderma. *British Medical Journal: (Clinical research ed.), 287*(6404), 1499. .

Fries, J., Spitz, P., & Young, D. (1978). Health assessment questionnaire. *Journal of Rheumatology, 23,* 137-45.

Garrett, V. D., Brantley, P. J., Jones, G. N. & McKnight, T. (1991). The relation between daily stress and Crohns disease. *Journal of Behavioural Medicine, 14*(1), 87-96.

Gieler, U., Niemeier, V., Kupfer, J., & Harth, W. (2008). Psychosomatic dermatology. *Hautarzt, 59*(5), 415.

Gilbert, P. (2000). Social mentalities: Internal 'social' conflict and the role of inner warmth and compassion in cognitive therapy. In P. Gilbert, & K. G., Bailey (Eds.). *Genes on the couch: explorations in evolutionary psychotherapy* (pp.118-150). Hove: Brunner-Routledge.

Gilbert, P. (2001). Evolutionary approaches to psychopathology: the role of natural defences. *Australian and New Zealand Journal of Psychiatry, 35*(1), 17-27.

Gilbert, P. (2002). Evolutionary approaches to psychopathology and cognitive therapy. *Journal of Cognitive Psychotherapy: An International Quarterly, 16*(3), 263- 294.

Gilbert, P. (2007). *Psychotherapy and Counselling for Depression (3rd ed).* London, UK: Sage.

Gilbert, P. (2010). *Compassion focused therapy: distinctive features*. New York, NY: Routledge.

Gilbert, P. (2012). *Human nature and suffering*. New York: NY. Psychological Press. (Original work published in 1989.)

Gilbert, P., Clarke, M., Hempel, S., Miles J. N. V., & Irons, C. (2004). Criticizing and reassuring oneself: an exploration of forms, styles and reasons in female students. *British Journal of Clinical Psychology, 43*(1), 31-50.

Gilbert, P., Baldwin, C., Irons, M. W., Baccus, J. R., & Palmer, M. (2006). Self-criticism and self-warmth: an imagery study exploring their relation to depression. *Journal of Cognitive Psychotherapy, 20*(2), 183-200.

Gilbert, P., McEwan, K., Mitra, R., Franks, L., Richter, A., & Rockliff, H. (2008). Feeling

safe and content: a specific affect regulation system. Relationship to depression anxiety, stress and self-criticism. *The Journal of Positive Psychology, 3*(3), 182-191.

Giuggioli, D., Manfredi, A., Colaci, M., & Ferri, C. (2010). Oxycodone in the long-term treatment of chronic pain related to scleroderma skin ulcers. *Pain Medicine, 11*(10), 1500–503.

Gold, D. B., & Wegner, D. M. (1995). Origins of ruminative thought: trauma, incompleteness, nondisclosure, and suppression. *Journal of Applied Social Psychology, 25*(14), 1245-1261.

Goldin, P. R., McRae, K., Ramel, W., & Gross, J. J. (2008). The neural bases of emotion regulation: reappraisal and suppression of negative emotion. *Biological Psychiatry, 63*(6), 577-586.

Goldsmith, R.E., Valdimarsdottir, H., Amend., K.L., Stoudt, B.G., Rini, C., Hershman, D., …….. Bovbjerv, B.H. (2010). Traumatic stress symptoms and breast cancer: The role of childhood abuse. *Child Abuse & Neglect, 34(6)* 465-470.

Goodwin, R.D., & Stein, M.B. (2004). Association between childhood trauma and physical disorders among adults in the United States. *Psychological Medicine, 34*(3), 509-520.

Griffin, D.W., & Bartholomew. K. (1994). The metaphysics of measurement: the case of adult attachment. In K. Batholomew, & D. P. Perlman (Eds.). Advances in personal relationships: attachment processes in adult relationships, Vol. 5, pp 17-52 London UK: Kingsley

Gross, J. J. (1998). The emerging field of emotional regulation: An integrative review. *Review of General Psychology, 2*(3), 271-299.

Gross, J. J. (2002), Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*(3), 281-291.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348-362.

Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: physiology, self-report, and expressive behaviour. *Journal of Personality and Social Psychology*, *64*(6), 970.

Guédeney, N,, Fermanian, J., & Bifulco, A, (2010). Construct validation study of the Relationship Scales Questionnaire (RSQ) on an adult sample. *Encephale*, *36*(1):69-76.

Habersack, M., & Luschin, G. (2013). Insecurities of women regarding breast cancer research: a Qualitative Study. *PloS one*, *8*(12), e81770.

Hammad, M., Barsky, A., & Regestein, Q. (2001). Correlation between somatic sensation inventory scores and hyper-arousal scale scores. *Psychosomatics. 42(1),* 29-34.

Hayes, S. C., Wilson, K. W., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioural disorders: a functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152-1168.

Heit, S., Graham, Y., & Nemeroff, C. B. (1999). Neurobiological effects of early trauma. *The Harvard Mental Health Letter, 16*(4), 4-6.

Hill, J., Holcombe, C., Clark, M., Boothby, R. K., Hincks, A., Fisher, J., ... & Salmon, P. (2011). Predictors of onset of depression and anxiety in the year after diagnosis of breast cancer. *Psychological Medicine 41*(7), 1429-1436.

Hinchcliff, M., & Varga, J. (2008). Systemic sclerosis/scleroderma: a treatable multisystem disease. *American Family Physician*, *78*(8), 961-8.

Holland, J. C., (1998). *Psycho-oncology*. New York: Oxford University Press.

Holland, J. C, (2002). History of psycho-oncology: overcoming attitudinal and conceptual

barriers. *Psychosomatic Medicine, 64*(2), 206-221.

Hui, K. K., Johnston, M. F., Brodsky, M., Tafur, J., & Kim Ho, M. (2007). Scleroderma stress and CAM utilization. *eCAM,142,* 1-4.

Hunt, C. & Jarry, M. (1997). Anxiety disorders. In P. Beumont G. Andrews P. Boyce & V. Carr (Eds), *Psychological Medicine: a Companion to Management of Mental Disorders. (*pp. 256-263) Sydney, Australia: World Health Organization Collaborating Centre for Mental Health and Substance Abuse.

Hyphantis, T. N., Tsifetaki, N., Pappa, C., Voulgan, P. V., Siafaka, V., Bai. M., …. & Mavreas, V. (2007). Clinical features and personality traits associated with psychological distress in systemic sclerosis patients. *Journal of Psychosomatic Research, 62*(1), 47-56.

Irons, C., Gilbert, P., Baldwin, M. W., Baccus, J. R., & Palmer, M. (2006). Parental recall, attachment relating and self-attacking/self-reassurance: their relationship with depression. *British Journal of Clinical Psychology, 45*(3), 297-308.

International Association for the Study of Pain (IASP). *Definition of pain.* <http://www.iasp-pain.org>, retrieved 12/9/2012.

Iwamitsu, Y., Shimoda, K., Abe, H., Tani, T., Okawa, M., & Buck, R. (2005). The relation between negative emotional suppression and emotional distress in breast cancer diagnosis and treatment. *Health Communication, 18*(3), 201-215.

Johnson, S.R., Hawker, G.A., & Davis, A.M. (2005). The health assessment questionnaire disability index and scleroderma health assessment questionnaire in scleroderma trials: the evaluation of their measurement properties. *American College of Rheumatology, 53*(2), 256-262.

Jones, G. T., Power, C., & Macfarlane, G. J. (2009). Adverse events in childhood and chronic widespread pain in adult life: results from the 1958 British Birth Cohort Study.

Pain, *143*(1), 92-96.

Kay, R. A., & Anderson, P. (2008). The principles of adaptive immunity. In M.C. Hotchenbergm A.J. Silman J.S. Smollen M.E. Weinblatt & M.H. Weisman (Eds.). *Rheumatology* (Vol. 1. 4th ed., pp. 133-140). London, UK: Mosby Elsevier.

Keefe, F. J., Porter, L. S., & Labban, J. (2006). *Emotion regulation processes in disease-related pain: a couples - based perspective*. In D. Snyder J. Simpson & J. Hughes (Eds.). Emotion regulation in couples and families: pathways to dysfunction and health (pp 207-229). Washington, DC: American Psychological Association.

Kern, S., & Ziemssen, T. (2008). Brain-immune communication: psychonueroimmunology of multiple sclerosis. *Multiple Sclerosis, 4*(1*),* 6-21.

Khan, F., Amatya, B., Pallant, J. F., & Rajapaksa, I. (2012). Factors associated with long-term functional outcomes and psychological sequel in women after breast cancer. *The Breast, 21*(3), 314–320.

Kiecolt-Glaser, J. K., & Glaser, R. (2003). Depression and immune function, central pathways to morbility and mortality. *Journal of Psychosomatic Research, 53*(2), 873-876.

Kucharz, E. J., Jarczyk, R., Jonderko, G., Rubisz-Brzezinska, J., & Brzezinska-Wcislo, L. (1996). High serum level of prolactin in patients with systemic sclerosis. *Clinical Rheumatology*, *15*(3), 314.

Kusnecov, A. W., & Rabin, B. S. (1994). Stressor-induced alterations of immune function: mechanisms and issues. *International Archives of Allergy and Immunology*, *105*(2), 107-121.

Langens, T. A., & Mörth, S. (2003). Repressive coping and the use of passive and active coping strategies. *Personality and Individual Differences, 35*(2), 461-473.

La Montagna, G., Baruffo, A., Pasquali, D., Bellastella, A., Tirri, G., & Sinisi, A. A. (2001). Assessment of pituitary gonadotropin release to gonadatropin releasing hormone/thyroid stimulating hormone stimulation in women with systemic sclerosis. *Rheumatology, 40*(3*),* 310-314.

Legendre, C., Allanore, Y., Ferrand. I., & Kahan, A. (2005). Evaluation of depression and anxiety in patients with systemic sclerosis. *Joint Bone Spine*; *72*(5), 408-411.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.

Lekander, M. (2002). Ecological Immunology: the role of the immune system in psychology and neuroscience. *European Psychologist 7*(2), 98-115.

Lee-Chiong, T., Gebhart, G. F., Mattay, R. A. (2010). *Chest Pain.* In R. J. Mason V.C. Broaddus, T., Martin, T., King, Jr. D., Schraufnagel, J. F., Murray, & J. A., Nadel. (Eds.). *Murray and Nadel's Textbook of Respiratory Medicine (Vol. 2., 5th ed., e-book*) Maryland Heights MO: Saunders Elsevier.

LeRoy, E. C., & Medsger, T. A., Jr. (2001). Criteria for the classification of early systemic sclerosis. *Journal of Rheumatology, 28*(7), 1573-1576.

Lovibond, P. F., & Lovibond, (1995). The structure of negative emotional states: comparison of the depression, anxiety, stress scales (DASS) with the Beck depression and anxiety inventories. *Behavioural Research and Therapy, 33*(3), 335343.

Luecken, L. J., Dausch, B., Gulla, V., Hong, R., & Compas, B. E. (2004). Alterations in morning cortisol associated with PTSD in women with breast cancer. *Journal of Psychosomatic Research*, *56*(1), 13-15.

Lynch, T. R., Robins, C. J., Morse, J. Q., & Krause, E. D. (2001). A mediational model relating affect intensity, emotion inhibition, and psychological distress. *Behaviour Therapy*, *32*(3), 519-536.

Maier, S. F., & Watkins, L. R. (1998). Cytokines for psychologists: implications of bidirectional immune-to-brain communication for understanding behaviour, mood and cognition. *Psychological Review, 105*(1), 83-107.

Malcarne, V. L., & Greenbergs, H. L. (2005). Psychological adjustment to systemic sclerosis. *Arthritis Care & Research, 9*(1**)**, 51- 59.

Marsland, A. L., Cohen, S., Rabin, B. S., & Manuck, S. B. (2001). Associations between stress, trait negative affect, acute immune reactivity, and antibody response to hepatitis B injection in healthy young adults. *Health Psychology*, *20*(1), 4.

Martinez, M. P., Miro, E., Sanchez, A. I., Mundo, A., & Martinez, E. (2012). Understanding the relationship between, attachment style, pain, appraisal and illness behaviour in women. *Scandinavian Journal of Psychology, 53*(1), 54-63.

Matos-Santos, A., Nobre, E. L., Costa, J. G., Nogueira, P. J., Macedo, A., Galvão-Teles, A., & De Castro, J. J. (2001). Relationship between the number and impact of stressful life events and the onset of Graves' disease and toxic nodular goitre. *Clinical Endocrinology, 55*(1), 15-19.

Mavaddat, N., Antoniou, A. C., Easton, D. F., & Garcia-Closas, M. (2010). Genetic susceptibility to breast cancer. *Molecular Oncology*, *4*(3), 174-191.

McWilliams, L. A., Cox, B. J., & Enns, M. W. (2000). Impact of adult attachment styles on pain and disability associated with arthritis in a nationally representative sample. *The Clinical Journal of Pain*, *16*(4), 360-364.

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: structure dynamics and change*. New York: The Guilford Press.

Miller, L. (2005). Neuroendocrine and immune system interactions in stress and depression.

Psychiatric Clinics of North America, *21*(2), 443-463.

Miller, H., Rehberger, P., Gunther, C., & Schmitt, J. (2012). Determinants of disability, quality of life and depression in dermatological patients with systemic scleroderma. *British Journal of Dermatology, 166,* 343–353.

Mormont, M. C., & Levi, F. (1997). Circadian system alterations during cancer processes: a review. *International Journal of Cancer*, *70*(2), 241-247.

Mukerjee, D., St George, D., Coleiro, B., Knight, C., Denton, C. P., Davar, J., Black, C. M. (2003). Prevalence and outcome in systemic sclerosis associated pulmonary arterial hypertension: application of a registry approach. *Annals of Rheumatic Diseases, 62,* 1088-1093.

National Scientific Council, (2014). "Excessive stress disrupts the development of brain architecture", *Journal of Children's Services*, *9(2),* 143-153.

Neff, K. (2003a). Self-compassion: an alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*(2), 85-101.

Neff, K. D. (2003b). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*(3), 223-250.

Neff, K. D., Kilpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality 41*(1), 139-154.

Nietert, P. J., Mitchell, H. C., Bolster, M. B., Curran, M.Y., Yilley, B. C., & Silver R. M. (2005). Correlates of depression including overall and gastrointestinal functional status, among patients with systemic sclerosis. *The Journal of Rheumatology, 32*(1), 51-57.

Nezu, A. M., Ronan, G. F., Meadows, E. A., & McClure, K. S. (Eds.). (2002). *Practitioner's Guide to Empirically-Based Measures of Depression,* New York: Kluwer Academic Publishers.

Nurius, P.S., Green, S., Logan-Greene, P., & Boria, S., (2015). Life course pathways of adverse childhood experiences toward adult psychological well-being: A stress process analysis. *Child Abuse & Neglect.*

Pace, T., Negi, L. T., Ademe, D., Cole, S., Sivilli, T., Brown, T.,..... & Raison, C. L. (2009). Effect of compassion meditation on neuroendocrine, innate immune and behavioural responses to psychosocial stress. *Psychoneuroendocrinology, 34*(1), 87- 98.

Palesh, O., Butler, L. D., Koopman, C., Giese-Davis, J., Carlson, R., & Spiegel, D. (2007). Stress history and breast cancer recurrence. *Journal of Psychosomatic Research, 63*(3), 233-239.

Pawlak, C. R., Witte, T., Heiken, H., Hundt, M., Schubert, J., Wiese, B.,..... & Schedlowski, M. (2003). Flares in patients with systemic lupus erythematosus is associated with daily psychological stress. *Psychotherapy and Psychosomatics, 72*(3), 159-165.

Petrie, K. J., Booth, R. J., & Pennebaker, J. W. (1998). The immunological effects of thought suppression. *Journal of Personality and Social Psychology, 75*(5), 1264.

Pfaff, D. W. (2005). *Brain arousal and information theory: neural and genetic mechanisms.* New York, NY: Harvard University Press.

Pignone, M. P., Gaynes, B. N., Rushton, J. L., Burchell, C. M., Orleans, C. T., Mulrow, C. D., & Lohr, K. N. (2002). Screening for depression in adults: a summary of the evidence for the US Preventive Services Task Force. *Annals of Internal Medicine, 136*(10), 765-776.

Przezdziecki, A., Sherman, K. A., Baillie, A., Taylor, A., Foley, E., & Stalgis‐Bilinski, K. (2013). My changed body: breast cancer, body image, distress and self-compassion. *Psycho-Oncology, 22*(8), 1872-1879.

Puig, J., Englund, M. M., Simpson, J. A., Collins, W. (2013). Predicting Adult Physical Illness from Infant Attachment: A Prospective Longitudinal Study. *Health Psychology, 32(4),*

409-17.

Rainville, P., Boa, Q.V. H., & Chretien, P. (2005). Pain-related emotions modulate experimental pain perception and autonomic responses. *Pain, 118*(3), 306-318.

Ravitz, P., Maunder, R., Hunter, J., Sthankiva., B & Lancee, W. (2010). Adult attachment measures: A 25-year review. *Journal of Psychosomatic Research, 69(4),* 419-432.

Reyes, A. (2011). Self-compassion: a concept analysis. *Journal of Holistic Nursing, 30*(2), 81-89.

Rice, P.L. (1999). *Stress and health* (2nd Ed.). California: Brookes/Cole.

Richards, H. L., Herrick, A. L., Griffin, K., Gwilliam, P. D. H., & Fortune, D. G. (2004). Psychological adjustment to systemic sclerosis: exploring the association of disease factors, functional ability, body related attitudes and fear of negative evaluation. *Psychology Health and Medicine, 9*(1), 29-39.

Richter, A., Gilbert, P., & McEwan, K. (2009). Development of an early memories of warmth and safeness scale and its relationship to psychopathology. *Psychology and Psychotherapy: Theory, Research and Practice, 82*(2), 171-184.

Roca, R. P., Wigley, F. M., & White, B. (1996). Depressive symptoms associated with scleroderma. *Arthritis Care & Research, 39*(6**),** 1035-1040.

Sachs-Ericsson, N., Blazer, D., Plant, A. E., & Arnow, B. (2005). Childhood sexual and physical abuse and the 1-year prevalence of medical problems in the national comorbidity survey. *Health Psychology, 24*(1), 32-40.

Sarafino, E. P., (2008). *Health psychology: biopsychosocial interactions* (2nd ed.). Milton Australia: Wiley and Sons.

Schlatter, M. C., & Cameron, L. D. (2010). Emotional suppression tendencies as predictors of symptoms, mood, and coping appraisals during AC chemotherapy for breast

cancer treatment. *Annals of Behavioural Medicine, 40*(1), 15-29.

Schore, A. N. (1994). *Affect regulation and the origin of the self: the neurobiology of emotional development*. Mahwah, NJ: Erlbaum.

Schore, A. N. (2002). Dysregulation of the right brain: a fundamental mechanism of traumatic attachment and the psychopathogenesis of posttraumatic stress disorder *Australian and New Zealand Journal of Psychiatry, 36*(1), 9-30.

Schore, J. R., &. Schore, A. N. (2009). Modern Attachment Theory: the central role of affect regulation in development and treatment. *Clinical Social Work Journal, 36(1), 9-20.*

Selye, H. (1950). Stress and the general adaption syndrome. *British Medical Journal, 1*(4667), 1383-1392.

Selye, H. (1976). Forty years of stress research: principal remaining problems and misconceptions. *Canadian Medical Association Journal, 115*(1), 53-56.

Sephton, S., & Spiegel, D. (2003). Circadian disruption in cancer: a neuroendocrine-immune pathway from stress to disease. *Brain, Behaviour and Immunity*, *17*(5), 321-328.

Sharpiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-based stress reduction for health care professionals: results from a randomised trial. *International Journal of Stress Management, 12*(2), 164-176.

Simpson, J. A., & Rholes, W. S. (Eds.). (1998). *Attachment theory and close relationships*. Guilford Press.

Smith, E. A., & Kahaleh, B. (2008). Systemic sclerosis: etiology and pathogenesis. In M.C. Hotchenbergm A.J. Silman J.S. Smollen M.E. Weinblatt & M.H. Weisman (Eds.). Rheumatology (Vol. 2. 4th ed., pp. 1387-1398). London, UK: Mosby Elsevier.

Sobrinho, L. G**.** (2003). Prolactin, psychological stress and environment in humans: adaptation and maladaptation. *Pituitary, 6*(1), 35-39.

Sobrinho, L. G., Nunes, M. C., Calhaz-Jorge, C., Alfonso, A. M., Pereira, M. C., & Santos, M.A. (1998). Hyperprolactinemia in women with paternal deprivation during childhood. *Obstetrics & Gynecology, 64*(1), 465-467.

Sonino, N., Navarrini, C., Ruini, C., Fallo, F., Boscaro, & M., & Fava, G. A. (2004). Life events in the pathogenesis of hyperprolactinemia. *European Journal of endocrinology, 151*(1), 61- 65.

Soper, D. Statistics Calculator. Retrieved, July, 2011; September, 2013 from *http://www.danielsoper.com/statcalc/*

Spiegel. D., Giese-Davis, J., Taylor, B., & Kraemer, H. (2006). Stress sensitivity in metastatic breast cancer: analysis of hypothalamic-pituitary-adrenal axis function. *Psychoneuroendocrinology, 31*(10), 1231–1244.

Steen, V. D., (2008). Epidemiology and classification of scleroderma. In M.C. Hotchenbergm A.J. Silman J.S. Smollen M.E. Weinblatt & M.H. Weisman (Eds.). Rheumatology (Vol. 2. 4th ed., pp. 1361-1366). London, UK: Mosby Elsevier.

Steen, V. D., & Medsger, T. A. (1997). The value of the Health Assessment Questionnaire and special patient-generated scales to demonstrate change in systemic sclerosis patients over time. *Arthritis Rheumatology, 40*(11), 1984-91.

Steen, V. D., & Medsger, T. A. (2001). Improvement in skin thickening in systemic sclerosis associated with improved survival. *Arthritis & Rheumatism, 44*, 2828-2835.

Steen, V. D., & Medsger, T. A. (2006). Changes in causes of death in systemic sclerosis, 1972–2002. *Annals of Rheumatic Diseases, 66*, 940-944.

Stein, M. B., & Kennedy, C. (2001). Major depressive and posttraumatic stress disorder comorbility in female victims of intimate partner violence. *Journal of Affective Disorders, 66*(2), 133-138.

Stojanovich, L., & Marisavljevich, D. (2008). Stress as a trigger of autoimmune

disease. *Autoimmune Review, 7*(3), 209-13.

Sumpio, B. E., Riley, J. T., & Dardik, A. (2002). Cells in focus: endothelial cell. *The International Journal of Biochemistry and Cell Biology, 34*(12), 1508-1512.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.), Boston: Allwyn and Bacon

Tache, Y., Martinez, V., Million, M., & Wang, L. (2001). Stress and the gastrointestinal tract III. Stress-related alterations of gut motor function: role of brain corticotropin releasing factor receptors. *American Journal of Physiology-Gastrointestinal Liver Physiology, 280*(2), 173-177.

Tacon, A. M., Caldera, Y. M., & Bell, N. J. (2001). Attachment style, emotional control, and breast cancer. *Family, Systems & Health, 19*(3), 319-326.

Tamagawa, R., Giese-Davis, J., Speca, M., Doll, R., Stephen, J., & Carlson, L. E. (2013). Trait mindfulness, repression, suppression, and self-reported mood and stress symptoms among women with breast cancer. *Journal of Clinical Psychology, 69*(3), 264–277.

Tan, G., Jensen, M. P., Thornby, J., & Sloan, P. A. (2008). Negative emotions, pain, and functioning. *Psychological Services, 5*(1), 26.

Teicher, M. H., Ito, Y., Glod, C. A., Andersen, S. L., Dumont, N., & Ackerman, E. (1997). Preliminary evidence for abnormal cortical development in physically and sexually abused children using EEG coherence and MRI. *Annals of the New York Academy of Sciences, 821*(1), 160-175.

Thakkar, R. R., & McCanne, T. R. (2000). The effects of daily stressors on physical health in women with and without a childhood history of sexual abuse. *Child Abuse & Neglect, 24*(2), 209-221.

Thomas, E., Moss-Morris, R., & Faquhar, C. (2006). Coping with emotions and abuse history in women with chronic pelvic pain. *Journal of Psychosomatic Research, 60*(1), 109-112.

Thombs, B. D., Hudson M., Taillefer, S. S., & Baron, M., (2008). Prevalence and clinical correlates of symptoms of depression in patients with systemic sclerosis. *Arthritis & Rheumatism, 59*(4), 504-509.

Tuck, N. L., & Consedine, N.S., (2015). Breast cancer screening: The role of attachment *Psychology, Health & Medicine, 20(4),* 400-409.

Van der Kolk, B. A., & Greenberg, M. S. (1987). *The psychobiology of the trauma response, hyper-arousal, constriction and addiction to traumatic re-exposure.* In B. A., Van der Kolk, (ed.). Psychological trauma, (pp. 63-88). American Psychiatric Publishing. http://books.google.com.au/books.

Vahdaninia, M., Omidvari, S., & Montazer, A. (2010). What do predict anxiety and depression in breast cancer patients? A follow-up study. *Social Psychiatry and Psychiatric Epidemiology, 45*(3), 355-361.

Varga, J. (2004). *Systemic sclerosis: introduction and overview.* Scleroderma Voice: Byfield M.A. Scleroderma Federation.

Vera-Lastra, O., Jara, L. J., Medina, G., Rojas, J. L., Veláquez, F., Ariza, R., ... & Fuentes, M. (2006). Functional hyperprolactinemia and hypophyseal microadenoma in systemic sclerosis. *Journal of Rheumatology, 33*(11), 1108-1112.

Whiteside, T. L. (2006). Immune suppression in cancer: effects on immune cells, mechanisms and future therapeutic intervention. In *Seminars in Cancer Biology, 16*(1), 3-15.

Wilhelm, K., Mitchell, P., Slade, T., Brownhill, S., & Andrews, G. (2003). Prevalence and correlates of DSM-IV major depression in an Australian national survey. *Journal of*

Affective Disorders, 75(2), 155-162.

Wilson, J. P., Friedman, M. J., & Lindy, J. D. (2001). *Treating psychological trauma and PTSD.* New York, NY: Guilford Press.

Wren, A., Somers, T. J., Wright, M. A., Goetz, M. C., Leary, M. R., Fras, A. M., ... & Keefe, F. J. (2011). Self-compassion in patients with persistent musculoskeletal pain: relationship of self-compassion to adjustment to persistent pain. *Journal of Pain and Symptom Management, 43*(4), 759-770.

Appendices **Page**

Appendix A

Survey (see Appendix A for questionnaires)

Appendix B

List of Significant Statistical Analysis Study 1 (see Appendix **B**/C/D for output)

Scleroderma and Psychosocial Variables

Frequencies

Reliability Statistics

Multiple Regression Analysis– Pain

MANOVA: Pain

Multiple Regression Analysis: Raynaud's

MANOVA: Skin Groups

Multiple Regression Analysis – Depression

Mann Witney U-Test – Depression

Multiple Regression Analysis – Anxiety

Appendix C

Appendix D

List of Statistical Analysis Study 3 (see Appendix B/C/**D** file for output)

Scleroderma, Breast Cancer, Community and Psychosocial Variables

Study 3(a): Comparison - Scleroderma and Breast Cancer Groups

Multiple Regression Analysis – Differences in Predictor Variables

Study 3(b): Comparison – Scleroderma/Breast Cancer/Community

Kruskal-Wallis Test –Psychosocial Variables

Mann Witney U-Test

Scleroderma, Breast Cancer and Community Groups – Mental Health

Mann Witney U-Tests

Appendix E: Correlations (see excel files for First Study: Scleroderma)

Appendix F: Correlations (see excel files for First Study Diffuse/Limited)

Appendix G: Correlations (see excel files for Third Study Breast Cancer/Scleroderma)

Appendix H: Means and Standard Deviations for variables for Scleroderma, Breast Cancer and Community Groups.

Appendix A

Scleroderma Study

My name is Karen Kearney I am currently undertaking research with Dr. Dee Bartrum, as part of a PhD (Psychology) at Bond University. The focus of this study is to investigate the relationship between early experiences, cognitive and emotional aspects and scleroderma. Research has shown an association between scleroderma, anxiety, depression and stress prior to the onset of this disease. The current study will consider issues associated with the emotions and cognitions that may underlie the development of psychological conditions, such as depression, anxiety and physiological symptoms (e.g., Raynaud's, pain and inflammatory conditions) associated with scleroderma. The findings of this research will contribute to the body of literature in the area of scleroderma, and aid in the development of suitable psychological treatments and interventions for those diagnosed with this medical condition.

I conducted research in 2008 in relation to stressful life events and scleroderma. The results of this study can be found on the websites of the Scleroderma Australia, Scleroderma Qld, the U.K. Scleroderma Society and the International Scleroderma Network U.S.A. To undertake the current research I require people who have been diagnosed with scleroderma to complete a questionnaire. The questionnaire will contain statements from which the participants can choose a response. Confidentiality is assured by our procedure, in which only the combined results of all participants will be published. You may withdraw from the study at any time. We invite you to complete the questionnaire which will take approximately 30-40 minutes. Minimal research has been conducted in this area in relation to scleroderma, with your assistance we aim to add to existing research and our understanding of this disease.

If you have any questions concerning this study please contact either Dr. Dee Bartrum or myself.

Thank you in advance

Kind Regards,

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In the event that undue distress has been experienced or you identify that you require psychological support, we consider it appropriate to offer you the following referral services.

- **Lifeline** Provides a free 24-hour, telephone counseling service. Phone: **13 11 14. Bond University Clinic**, Gold Coast, Queensland. Phone: **(07) 5595 2527**
- Email**: psych_clinic@bond.edu.auAustralian Psychological Society**. **ww.psychology.org.au/ReferralService/About/**

Survey Instructions

Please read each statement carefully. Please tick the response that best represents your opinion. If you want to change your response to an item, please place a **cross** through the initial response and **tick** the correct response. Please give your most honest answer to assist us with our data.

Important: Please **complete all questions** in the questionnaire. Incomplete questionnaires may be removed from the study. The questionnaire should take about 30 – 40 minutes to complete.

Country: ☐ Australia ☐ United Kingdom

☐ United States of America ☐ Other: country please state _____

Please state your ethnic background

_____

Age: _____years _____ months

What type of Scleroderma do you have?

☐ Diffused
☐ Limited/ CREST
☐ Other Please Specify _____

Please rate	No Problem	Mild	Moderate	Severe
Skin involvement	☐	☐	☐	☐

☐ Swollen/inflamed Age diagnosed _____
☐ Thick skin Age diagnosed _____
☐ Tight skin Age diagnosed _____
☐ Skin softening Age diagnosed _____

How would you rate your scleroderma symptoms

	No problem	Mild	Moderate	Severe	Age
When first diagnosed	☐	☐	☐	☐	_____
When least severe	☐	☐	☐	☐	_____
When most severe	☐	☐	☐	☐	_____

Do you take medication for any of the indicated conditions?
☐ **Yes** ☐ **No**

Gender ☐ Female ☐ Male

Current relationship status
☐ Single ☐ Defacto Relationship
Time in relationship _____
☐ Divorced ☐ Married:
Time in relationship _____

Have you or a (genetically related) family member been

Biological Relative	You		Age Diagnosed
☐	☐	Other autoimmune disease	_____
☐	☐	Pituitary adenoma	_____
☐	☐	Elevated prolactin levels	_____
☐	☐	Bulemia/Anorexia (Circle one)	_____
☐	☐	Autism/ Aspergers Circle one)	_____
☐	☐	Anxiety	_____
☐	☐	Depression	_____
☐	☐	Post Traumatic Stress Disorder	_____
☐	☐	Other psychological condition	_____
		Please state _____	

Please state relative eg., parent, sibling, etc _____
Have you received counselling for any psychological condition? ☐ **No** ☐ **Yes Please specify** _____

☐ Yes Are you of Aboriginal
☐ No or Torres Strait Islander descent?

☐ Yes Is any biologically related relative of
☐ No Aboriginal or Torres Strait Island descent?

Please state biological relatives ethnic background

_____

Age at which you were diagnosed with Scleroderma
_____ years _____ months

Have you been diagnosed/exposed to any of the following

☐ Raynauds Age diagnosed _____
☐ Exposure to **Toxins** associated onset scleroderma
Please state type of toxin _____

Please state body areas affected by the following skin conditions
Swollen/inflamed _____
Thick skin _____
Tight skin _____
Skin softening _____

Overall would you rate your <u>current</u> scleroderma symptoms as
☐ Less Severe
☐ More Severe
☐, Remained Constant

How would you rate the severity of your symptoms before using medication? ☐ Mild ☐ Moderate ☐ Severe

Education ☐ Primary ☐ Secondary ☐ Tertiary

Occupation
Current occupation _____
Before diagnosis scleroderma_____
When first diagnosis scleroderma_____

diagnosed with any of the following:
Please indicate if diagnosed before or after you were diagnosed with scleroderma.

☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After
☐ Before	☐ After

Counselling: Before or after diagnosed with scleroderma.
☐ Before ☐ After

Have you been tested for elevated prolactin ☐ **No** ☐ **Yes**

Scleroderma Health Assessment Questionnaire (SHAQ)

In this section we are interested in learning how your illness affects your ability to function in daily life.

Please feel free to add any comments.

Please circle the response that best describes your usual abilities . <u>IN THE PAST SEVEN DAYS</u>.

	Without ANY difficulty	With SOME Difficulty	With MUCH Difficulty	UNABLE to do
Dressing and Grooming:				
Are you able to:				
Dress yourself including tying shoelaces and doing buttons	**0**	**1**	**2**	**3**
Shampoo your hair	**0**	**1**	**2**	**3**
Arising				
Are you able to:				
Stand up from an armless straight chair	**0**	**1**	**2**	**3**
Get in and out of bed	**0**	**1**	**2**	**3**
Eating				
Are you able to:				
Cut your meat	**0**	**1**	**2**	**3**
Lift a full glass to your mouth	**0**	**1**	**2**	**3**
Open a new milk carton	**0**	**1**	**2**	**3**
Walking				
Are you able to:				
Walk outdoors on flat ground	**0**	**1**	**2**	**3**
Climb up five stairs	**0**	**1**	**2**	**3**

Please check any AIDS or DEVICES that you usually use for any of these activities?

- ☐ Cane
- ☐ Walker
- ☐ Crutches
- ☐ Wheelchair
- ☐ Devices used for dressing (button hook, zipper pull, long handled shoe horn etc)
- ☐ Built up or special utensil
- ☐ Special or built up chair

☐ Other (Specify_____

Please check any categories for which you usually need ASSISTANCE FROM ANOTHER PERSON.

- ☐ Dressing & Grooming
- ☐ Arising
- ☐ Eating
- ☐ Walking

Please circle the response that best describes your usual abilities <u>IN THE PAST SEVEN DAYS.</u>

	Wthout ANY Difficulty	With SOME Difficulty	With MUCH Difficulty	UNABLE to do
Hygiene				
Are you able to:				
Wash and dry your body	**0**	**1**	**2**	**3**
Take a tub bath	**0**	**1**	**2**	**3**
Get on and off the toilet	**0**	**1**	**2**	**3**
Reach				
Are you able to:				
Reach and get down a 5 lb (approx 2 kg) object from above your head (e.g. sugar)	**0**	**1**	**2**	**3**
Bend down to pick clothing off the floor	**0**	**1**	**2**	**3**
Grip				
Are you able to:				
Open car doors:	**0**	**1**	**2**	**3**
Open jars that have been previously opened	**0**	**1**	**2**	**3**
Turn faucets (taps) on and off	**0**	**1**	**2**	**3**
Activities				
Are you able to:				
Run errands and shop	**0**	**1**	**2**	**3**
Get in and out of a car	**0**	**1**	**2**	**3**
Do chores such as vacuuming or yard work	**0**	**1**	**2**	**3**

Please check any of the following AIDs or Devices that you usually use for any of these activities?

☐ Other: Please specify _____

☐ Raised toilet seat
☐ Bathtub seat
☐ Bathtub bar
Long handled appliances
☐ For reach
Long handled appliances
☐ In the bathroom
☐ Jar opener (for jars previously opened)

Please check any categories for which you usually need HELP FROM ANOTHER PERSON.

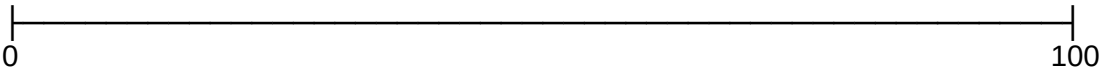
☐ Hygiene
☐ Reach
☐ Gripping and opening things
☐ Errands and chores

We are also interested in learning whether or not you are affected by pain because of your illness.

How much pain have you had because of your illness IN THE PAST WEEK ?

*PLACE A MARK ON THE LINE TO INDICATE THE **SEVERITY OF THE PAIN**.*

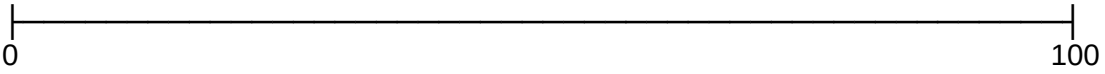
NO PAIN **VERY SEVERE PAIN**



IN THE PAST WEEK, how much have your intestinal problems interfered with your daily activities?

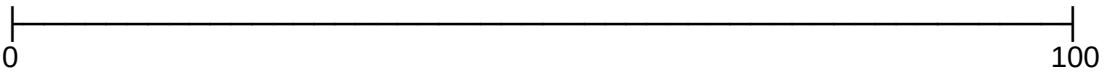
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

INTESTINAL PROBLEMS **VERY SEVERE**
DO NOT LIMIT ACTIVITIES **LIMITATION**



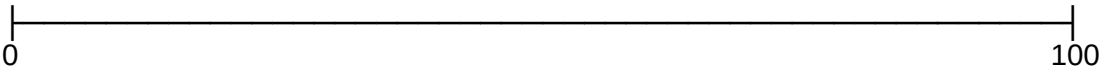
IN THE PAST WEEK, how much have your breathing problems interfered with your daily activities?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

BREATHING PROBLEMS **VERY SEVERE**
DO NOT LIMIT ACTIVITIES **LIMITATION**



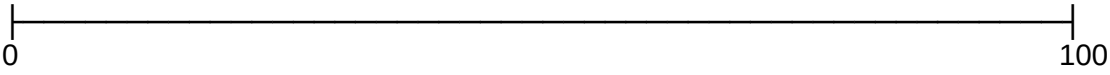
IN THE PAST WEEK, how much has Raynaud's interfered with your daily activities?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

RAYNAUD'S
DOES NOT LIMIT ACTIVITIES **VERY SEVERE LIMITATION**



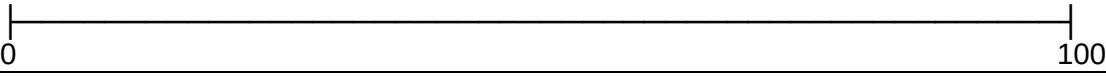
IN THE PAST WEEK, how much have your finger ulcers interfered with your daily activities?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

FINGER ULCERS **VERY SEVERE**
DO NOT LIMIT ACTIVITIES **LIMITATION**



Overall, considering how much pain, discomfort, limitations in your daily life and other changes in your body and life, how severe would you rate your disease today?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

NO DISEASE LIMITATION **VERY SEVERE**



Depression Anxiety and Stress Scale (DASS)

In this section we are interested in your experiences of stress.

Please read each statement and circle a number 0, 1, 2, or 3, which indicates how much the statement applied to you **OVER THE PAST WEEK**. There are no right or wrong answers. Do not spend too much time on any statement.

	Not at all	Sometimes	Frequently	Most of the time
1. I Found It hard to wind down	0	1	2	3
2. I was aware of dryness of my mouth	0	1	2	3
3. I couldn't seem to experience any positive feeling at all	0	1	2	3
4. I experienced breathing difficulty (eg. Excessively rapid breathing, breathlessness in the absence of physical exertion).	0	1	2	3
5. I found it difficult to work up the initiative to do things	0	1	2	3
6. I tend to over-react to situations	0	1	2	3
7. I experienced trembling (eg. In the hands)	0	1	2	3
8. I felt that I was using a lot of nervous energy	0	1	2	3
9. I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10. I felt that I had nothing to look forward to	0	1	2	3
11. I found myself getting agitated	0	1	2	3
12. I found it difficult to relax	0	1	2	3
13. I felt down-hearted and blue	0	1	2	3
14. I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15. I felt I was close to panic	0	1	2	3
16. I was unable to become enthusiastic about anything	0	1	2	3
17. I felt I wasn't worth much as a person	0	1	2	3
18. I felt that I was rather touchy	0	1	2	3
19. I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat).	0	1	2	3
20. I felt scared without good reason	0	1	2	3
21. I felt that life was meaningless	0	1	2	3

Relationship Scales Questionnaire (RSQ)

In this section we are interested in your interpersonal experiences.

Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about close relationships.

		Not at all like me		Somewhat like me		Very much like me
1.	I find it difficult to depend on other people.	1	2	3	4	5
2.	It is very important to me to feel independent.	1	2	3	4	5
3.	I find it easy to get emotionally close to others.	1	2	3	4	5
4.	I want to merge completely with another person.	1	2	3	4	5
5.	I worry that I will be hurt if I allows myself to become too close to others.	1	2	3	4	5
6.	I am comfortable without close emotional relationships.	1	2	3	4	5
7.	I am not sure that I can always depend on others to be there when I need them.	1	2	3	4	5
8.	I want to be completely emotionally intimate with others.	1	2	3	4	5
9.	I worry about being alone.	1	2	3	4	5
10.	I am comfortable depending on other people.	1	2	3	4	5
11.	I often worry that romantic partners don't really love me.	1	2	3	4	5
12.	I find it difficult to trust others completely.	1	2	3	4	5
13.	I worry about others getting too close to me.	1	2	3	4	5
14.	I want emotionally close relationships.	1	2	3	4	5
15.	I am comfortable having other people depend on me.	1	2	3	4	5
16.	I worry that others don't value me as much as I value them.	1	2	3	4	5
17.	People are never there when you need them.	1	2	3	4	5
18.	My desire to merge completely sometimes scares people away.	1	2	3	4	5
19.	It is very important to me to feel self-sufficient.	1	2	3	4	5
20.	I am nervous when anyone gets too close to me.	1	2	3	4	5
21.	I often worry that romantic partners won't want to stay with me.	1	2	3	4	5
22.	I prefer not to have other people depend on me.	1	2	3	4	5
23.	I worry about being abandoned.	1	2	3	4	5
24.	I am somewhat uncomfortable being close to others.	1	2	3	4	5
25.	I find that others are reluctant to get as close as I would like.	1	2	3	4	5
26.	I prefer not to depend on others.	1	2	3	4	5
27.	I know that others will be there when I need them.	1	2	3	4	5
28.	I worry about having others not accept me.	1	2	3	4	5
29.	Romantic partners often want me to be closer than I feel comfortable being.	1	2	3	4	5
30.	I find it relatively easy to get close to others.	1	2	3	4	5

Early Memories of Warmth and Safety Scale (EMWS)

In this section we are interested in your emotional memories

Below is a set of questions that tap various feelings you may have experienced when you were young. Please read each item carefully and circle the number to the right of the statement that best describes your feelings during childhood. Use the scale below.

0 = No, never	**1 = Yes, but rarely**	**2 = Yes, sometimes**	**3 = Yes, often**	**4 = Yes, most of the time**

1. I felt secure and safe.	0 1 2 3 4
2. I felt appreciated the way I was.	0 1 2 3 4
3. I felt understood.	0 1 2 3 4
4. I felt a sense of warmth with those around me.	0 1 2 3 4
5. I felt comfortable sharing my feelings and thoughts. with those around me	0 1 2 3 4
6. I felt people enjoyed my company.	0 1 2 3 4
7. I knew that I could count on empathy and understanding from people close to me when I was unhappy.	0 1 2 3 4
8. I felt peaceful and calm.	0 1 2 3 4
9. I felt that I was a cherished member of my family.	0 1 2 3 4
10. I could easily be soothed by people close to me when I was unhappy.	0 1 2 3 4
11. I felt loved.	0 1 2 3 4
12. I felt comfortable turning to people important to me for help and advice	0 1 2 3 4
13. I felt part of those around me.	0 1 2 3 4
14. I felt loved even when people were upset about something I had done.	0 1 2 3 4
15. I felt happy.	0 1 2 3 4
16. I had feelings of connectedness.	0 1 2 3 4
17. I knew I could rely on people close to me to console me when. I was upset	0 1 2 3 4
18. I felt cared about.	0 1 2 3 4
19. I had a sense of belonging.	0 1 2 3 4
20. I knew that I could count on help from people close to me when. I was unhappy	0 1 2 3 4
21. I felt at ease.	0 1 2 3 4

Emotion Regulation Questionnaire (ERQ)

In this section we would like to ask you some questions about your emotional life.

For each answer please use the following scale

1----------2----------3----------4----------5----------6----------7
Strongly Disagree Neutral Agree Strongly

1.	When I want to feel more positive emotion (such as joy amusement) I change what I am thinking about.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.	I keep my emotion to myself.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3.	When I want to feel less negative emotions (such as sadness or anger), I change what I am thinking about.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.	When I am feeling positive emotions, I am careful not to express them	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5.	When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6.	I control my emotions by not expressing them.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7.	When I want to feel more positive emotions, I change the way I'm thinking about the situation	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8.	I control my emotions by changing the way I think about the situation	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9.	When I am feeling negative emotions, I make sure not to express them	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10.	When I want to feel less negative emotion, I change the way I'm thinking about the situation.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Hyper-arousal Scale (HS)

In this section we would like to ask you how you generally respond in the following situations

Please rate the following experiences from not at all true to completely true	**Not at all true**	**A little true**	**Moderately true**	**Quite true**	**Completely true**
1. I am well organized					
2. I am slow to awaken in the morning					
3. I am a very careful worker					
4. My mind is always going					
5. I think a lot about feelings					
6. Bright lights, crowds, noise or traffic bother me					
7. Evenings are my best time					
8. I cannot take naps even when I try					
9. I tend to anticipate problems					
10. My bedroom is a mess					
11. I take things personally					
12. I get rattled when a lot happens at once					
13. I am good at details					
14. I have trouble falling asleep					
15. I am a cautious person					
16. In bed at night my thoughts keep going					
17. A sudden loud noise could cause me a prolonged reaction					
18. I am overly conscientious					
19. Caffeine affects me strongly					
20. When things go wrong, I tend to get depressed					
21. My routine is predictable					
22. Some thoughts return too often					
23. I take a long time to make decisions					
24. Alcohol makes me sleepy					
25. I get tearful easily					
26. I keep thinking about the same things long after they happened					

Self-Compassion Scale (SCS)

In this section we would like to ask you how you typically act towards yourself in difficult times

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never **Almost always**
1 2 3 4 5

_____ 1. I'm disapproving and judgmental about my own flaws and inadequacies.

_____ 2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.

_____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.

_____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.

_____ 5. I try to be loving towards myself when I'm feeling emotional pain.

_____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.

_____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.

_____ 8. When times are really difficult, I tend to be tough on myself.

_____ 9. When something upsets me I try to keep my emotions in balance.

_____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.

_____ 11. I'm intolerant and impatient towards those aspects of my personality I don't like.

_____ 12. When I'm going through a hard time, I give myself caring and tenderness I need.

_____ 13. When I'm feeling down, I tend to feel like most other people are probably happier than I am.

_____ 14. When something painful happens I try to take a balanced view of the situation.

_____ 15. I try to see my failings as part of the human condition.

_____ 16. When I see aspects of myself that I don't like, I get down on myself.

_____ 17. When I fail at something important to me I try to keep things in perspective.

_____ 18. When I'm really struggling, I tend to feel like other people must be having an easier time of it.

_____ 19. I'm kind to myself when I'm experiencing suffering.

_____ 20. When something upsets me I get carried away with my feelings.

_____ 21. I can be a bit cold-hearted towards myself when I'm experiencing suffering.

_____ 22. When I'm feeling down I try to approach my feelings with curiosity and openness.

_____ 23. I'm tolerant of my own flaws and inadequacies.

_____ 24. When something painful happens I tend to blow the incident out of proportion.

_____ 25. When I fail at something that's important to me, I tend to feel alone in my failure.

_____ 26. I try to be understanding and patient towards those aspects of my personality I don't like.

List of Referral Counselling Services

In the event that undue distress has been experienced, or you identify that you require psychological support, we consider it appropriate to offer you the following counselling referral services:

Australia

- **Lifeline**
- Provides a free 24-hour, telephone counseling service.
- Phone: **13 11 14.** from any state or territory in Australia.

- **Bond University Clinic**, Gold Coast, Queensland.
- Phone: **(07) 5595 2527**
- Email**: psych_clinic@bond.edu.au**

- **Australian Psychological Society**.
- Find a Psychologist Service
- Covering every state and territory.
  www.psychology.org.au/ReferralService/About/

The United States of America

- **U.S. listing for psychologists** http://locator.apa.org/ .

  The International Scleroderma Network also offers free general well-moderated support services online, 24 hours a day, through Sclero Forums, at http://www.sclero.org/forums/
- **Toll-free helpline** number for U.S. residents is **1-800-564-7099**.

- **Resources for Emotional Adjustment and Scleroderma** are at: http://www.sclero.org/support/emotional-adj/a-to-z.html

United Kingdom

- **The British Psychological Society**
- The Directory of Chartered Psychologists
- http://www.bps.org.uk/findpsychologist/psychoindex.cfm
-
- **The Samaritans**, 24 hour a day
- Confidential emotional support for anyone in a crisis
- Phone: **08457 909090**
- www.**samaritans**.org

Breast Cancer Study

My name is Karen Kearney I am currently undertaking research with Dr. Richard Hicks and Dr. Peta Stapleton, as part of a PhD (Psychology) at Bond University. The focus of this study is to investigate the relationship between psychological stress and breast cancer. Research has shown an association between stress and suppression of the immune system and breast cancer. Breast cancer is an immune related disease and is associated with anxiety, depression and stress. The current study will consider early stress experiences, emotions and cognitions that may generate stress/distress and the association between these aspects and breast cancer. Furthermore these aspects will also be investigated in relation to depression and anxiety associated with breast cancer. The findings of this research will contribute to the body of literature in the area of breast cancer and aid in the development of suitable psychological treatments and interventions for those diagnosed with this medical condition.

To undertake the current research we require individuals who have been diagnosed with breast cancer to complete a questionnaire. The questionnaire will contain statements from which the participants can choose a response. Confidentiality is assured by our procedure, in which only the combined results of all participants will be published. We invite you to complete the questionnaire which will take approximately 30 minutes.

Minimal research has been conducted in this area in relation to breast cancer, with your assistance we aim to add to existing research and our understanding of this disease.

If you have any questions concerning this study please contact either Dr. Richard Hicks Dr. Peta Stapleton or myself.

Thank you in advance

Kind Regards,

Karen Kearney Email: kakearne@student.bond.edu.au

Dr. Richard Hicks Email: rhicks@bond.edu.au
Professor; School of Psychology

Dr Peta Stapleton Email: pstapleton@bond.edu.au
Assistant Professor, School of Psychology
Faculty of Humanities and Social Sciences
Bond University, Robina, QLD, 4229, Australia

Ethics Officer Email: buhrec@bond.edu.au

Survey Instructions

Please read each statement carefully. Please cross the response that best represents your opinion.
If you want to change your response to an item, please place a line through the initial response and cross the correct response. Please give your most honest answer to assist us with our data. We invite you to complete the questionnaire which will take approximately 30 minutes. There is an attachment that describes the types, stages and categories of breast cancer to assist you with these specific questions.

In the event that undue distress is experienced after completing this survey, or you identify that you require psychological support, we have listed counseling referral services on the last page of this survey and you are invited to contact them if needed.

Important: Please **complete all questions** in the questionnaire.

Please refer to appendix A for information to help you answer the breast cancer questions

Country: ☐ Australia
. ☐ Other Country
Please state _____

☐ Yes Are you of Aboriginal or
☐ No Torres Strait Island descent?

Gender ☐ Female ☐ Male

Education ☐ Primary ☐ Secondary
☐ Tertiary ☐ Post Grad

Current relationship status
☐ Single ☐ Defacto Relationship
Time in relationship _____
☐ Divorced ☐ Married:
Time in relationship _____
☐ Widowed Time in relationship _____

Occupation
Current occupation _____
Before diagnosis breast cancer _____
When first diagnosis breast cancer _____

Age: _____years _____ months

Age first diagnosed with breast cancer
_____ years _____ months

*** What type of breast cancer do you have?**
_____

(currently means within in the last month)
***What stage of breast cancer do you currently have _____**
***What stage when first diagnosed _____**
***What stage when most severe _____**

***What category of breast cancer do you currently have _____**
***What category when first diagnosed _____**
***What category when most severe _____**

Please state if benign ☐Yes ☐ No

Have you had surgery/treatment for your breast cancer ☐Yes ☐ No

If yes please state type of treatment/surgery and <u>date</u> surgery/treatment(s) was received
_____

How would you rate your breast cancer when first diagnosed?

☐ Mild
☐ Moderate
☐ Severe

How would you rate your breast cancer when most severe?

☐ Mild
☐ Moderate
☐ Severe

How would you currently rate your breast cancer?

☐ No longer experiencing symptoms
☐ Mild
☐ Moderate
☐, Severe

Other Health Information
Have you been diagnosed with scleroderma
☐Yes ☐ No

Have you been diagnosed with any other health condition/disease ☐Yes ☐ No

Please state condition/disease _____
_____ _____

Have you been diagnosed with any of the following:
Please indicate if diagnosed **before** or **after** you were **diagnosed with breast cancer**?

Before	After	
☐	☐	☐ Depression
☐	☐	☐ Posttraumatic Stress Disorder (PTSD)
☐	☐	☐ Anxiety
☐	☐	☐ Other psychological condition Please state _____
☐	☐	☐ Have you received counseling for any of the stated conditions

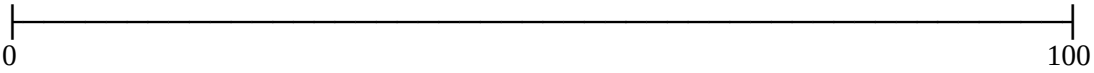
Please state condition if you have received counseling
_____

We are also interested in learning whether or not you are affected by pain and other changes in your body due to your breast cancer. Please indicate severity on the scale below from… 0 to 100.

How much pain have you had because of your illness IN THE PAST WEEK?

*PLACE A MARK ON THE LINE TO INDICATE THE **SEVERITY OF THE PAIN**.*

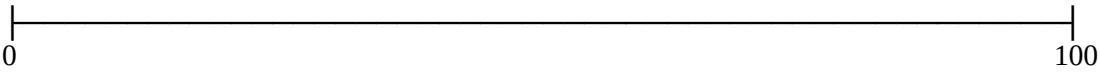
NO PAIN **VERY SEVERE PAIN**



0 100

How much nausea do you have because of your illness IN THE PAST WEEK?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

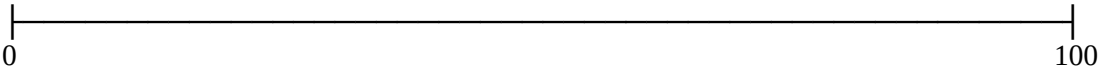
NO DISEASE LIMITATION **VERY SEVERE**



0 100

How much fatigue do you have because of your illness IN THE PAST WEEK?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

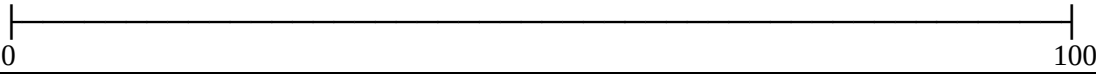
NO DISEASE LIMITATION **VERY SEVERE**



0 100

Overall, **considering how much pain, fatigue, nausea and discomfort, limits your daily life and other changes in your body and life, how severe would you rate your disease today**?
PLACE A MARK ON THE LINE TO INDICATE THE LIMITATION OF ACTIVITY.

NO DISEASE LIMITATION **VERY SEVERE**



0 100

The Breast Cancer Survey also included all psychosocial questionnaires in the scleroderma study

Thank you for completing the survey

Counseling Services

In the event that undue distress has been experienced, or you identify that you require psychological support, we have listed the following counseling referral services:

- **Lifeline**
- Provides a free 24-hour, telephone counseling service.
- Phone: **13 11 14** from any state or territory in Australia.

- **Bond University Clinic**, Gold Coast, Queensland.
- Phone: **(07) 5595 2527**
- Email**: psych_clinic@bond.edu.au**

- **Australian Psychological Society**.
- Find a Psychologist Service
- Covering every state and territory.
  www.psychology.org.au/ReferralService/About/

Appendix 1

Types of Breast Cancer

- **Ductal carcinoma in situ (DCIS)** is a non-invasive breast cancer confined to the ducts of the breast.
- **Lobular carcinoma in situ (LCIS)** is a non-invasive breast cancer confined to the lobules of the breast.
- **Early breast cancer** is an invasive breast cancer that is contained in the breast and may or may not have spread to lymph nodes in the breast or armpit. Some cancer cells may have spread outside the breast and armpit area but cannot be detected.
- **Locally advanced breast cancer** is an invasive breast cancer that has spread to areas near the breast, such as the chest wall.
- **Secondary breast cancer (**also called metastatic or advanced breast cancer) is an invasive breast cancer that has spread from the breast to other parts of the body.
- **Paget's disease of the nipple** is a rare form of invasive breast cancer that affects the nipple and the area around the nipple (the areola).
- **Inflammatory breast cancer** is a rare form of invasive breast cancer that affects the blood vessels in the skin of the breast, causing the breast to become red and inflamed.

Stages of Breast Cancer

- **Stage 0:** pre-invasive' breast cancer such as ductal carcinoma in situ (DCIS) or lobular carcinoma in situ (LCIS)
- **Stage I:** early breast cancer
- **Stage II:** early breast cancer
- **Stage IIB** and **III:** advanced breast cancer
- **Stage IV:** advanced breast cancer (locally advanced breast cancer or secondary breast cancer).

Categories of Breast Cancer

- **Category 1:** breast cancer cells in one to three lymph nodes in the armpit.
- **Category 2:** breast cancer cells in 4–9 lymph nodes in the armpit, and lymph nodes are enlarged, and/or attached to each other or to nearby tissue; or 1 or more lymph nodes under the breastbone not in the armpit lymph nodes

Category 3: breast cancer cells in 10 or more lymph nodes in the armpit or 1 or more lymph nodes above or below the collarbone or 1 or more lymph nodes under the breastbone and 1 or more lymph nodes in the armpit.

Community Sample

Bond University
Faculty of Humanities and Social Sciences

Psychosocial Stressors and Emotional Regulation in a Community Sample

My name is Karen Kearney I am currently undertaking research with Dr. Dee Bartrum, as part of a PhD (Psychology) at Bond University. The focus of this study is to investigate issues associated with early life memories and the emotions and cognitions that may underlie the development of psychological conditions, such as depression, anxiety and stress in people who have **not** been diagnosed with scleroderma (an autoimmune disease). To undertake the current research, I require people who have **not** been diagnosed with scleroderma to complete a questionnaire. The questionnaire will contain statements from which participants can choose a response. Anonymity is assured by our procedure, in which only the combined results of all participants will be published. You may withdraw from the study at any time. We invite you to complete the questionnaire which will take approximately 30 minutes. Minimal research has been conducted in this area in relation to scleroderma, with your assistance we aim to add to existing research and our understanding of this disease.

If you have any questions concerning this study please contact either Dr. Dee Bartrum or myself.
Thankyou in advance
Kind Regards,

Karen Kearney Email: kakearne@student.bond.edu.au
Dr. Dee Bartrum Email: dbartrum@bond.edu.au
Clinic Director, Bond University Psychology Clinic
School of Psychology Faculty of Humanities and Social Sciences
Bond University, Gold Coast, Qld, 4229, Australia
Ethics Officer: Email: buhrec@bond.edu.au

In the event that undue distress has been experienced or you identify that you require psychological support, we consider it appropriate to offer you the following referral services.

- **Lifeline** Provides a free 24-hour, telephone counseling service. Phone: **13 11 14. Bond University Clinic**, Gold Coast, Queensland. Phone: **(07) 5595 2527**
- Email**: psych_clinic@bond.edu.au**
- **Australian Psychological Society**. ww.psychology.org.au/ReferralService/About/

Instructions

Please read each statement carefully. Please tick the response that best represents your opinion. If you want to change your response to an item, please place a **cross** through the initial response and **tick** the correct response. Please give your most honest answer to assist us with our data.

Important: Please **complete all questions** in the questionnaire. Incomplete questionnaires may be removed from the study. The questionnaire should take about 30 minutes to complete.

Country: ☐ Australia ☐ United Kingdom

☐ Other: please state country _____ ☐ United States of America

Age: _____years _____ months

Gender ☐ Female ☐ Male

Education ☐ Primary ☐ Secondary ☐ Tertiary

Current Occupation _____

Previous Occupation/s _____

Are you currently

☐ Single ☐ Defacto Relationship
Length of time in relationship ____
☐ Divorced ☐ Married:
Length of time married _____

Have you been diagnosed with Scleroderma.

No Yes Age diagnosed _____ years _____ months

Please state your ethnic background
_____

Please state biological relatives ethnic background
_____

If yes please do not continue completing this questionnaire?
You may like to complete the questionnaire for participants diagnosed with scleroderma.

Have you or a (genetically related) family member been diagnosed with any of the following:

You	Relative		Age Diagnosed
☐	☐	Scleroderma	_____
☐	☐	Other autoimmune disease	_____
☐	☐	Pituitary adenoma	_____
☐	☐	Elevated prolactin levels	_____
☐	☐	Anorexia	_____
☐	☐	Bulemia	_____
☐	☐	Anxiety	_____
☐	☐	Depression	_____
☐	☐	Autism	_____
☐	☐	Aspergers	_____
☐	☐	Post Traumatic Stress Disorder	_____
☐	☐	Acute Stress Disorder	_____
☐	☐	Other psychological condition	_____

Please state _____

Have you received counselling for any other psychological condition? No Yes

If yes please specify condition_____

The Community Survey also included all psychosocial questionnaires in the scleroderma study

Appendix B

Scleroderma Study 1 -Statistical Analysis

Frequencies - Demographic and Health Information

Age Statistics

		AgeDiagRaynds	AgeDiagSclero	CurrentAGE
N	Valid	38	76	76
	Missing	80	42	42
Mean		46.68	47.18	55.74
Median		48.50	50.00	57.50
Range		52	52	54
Minimum		20	20	26
Maximum		72	72	80

Sclero Limited Diffuse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	43	33.3	55.1	55.1
	2.00	35	27.1	44.9	100.0
	Total	78	60.5	100.0	
Missing	System	51	39.5		
Total		129	100.0		

Raynauds

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		41	34.7	34.7	34.7
	1	72	61.0	61.0	95.8
	2	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.3	2.9	2.9
	2	46	35.7	44.2	47.1
	3	34	26.4	32.7	79.8
	4	21	16.3	20.2	100.0
	Total	104	80.6	100.0	
Missing	System	25	19.4		
Total		129	100.0		

Country

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	24	18.6	18.6	18.6
1	34	26.4	26.4	45.0
3	69	53.5	53.5	98.4
5	2	1.6	1.6	100.0
Total	129	100.0	100.0	

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	24	18.6	18.6	18.6
1	96	74.4	74.4	93.0
2	9	7.0	7.0	100.0
Total	129	100.0	100.0	

Reliability Statistics - Scleroderma and Psychosocial Variables

Stress

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.825	7

Anxiety

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.699	.717	7

Depression

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.927	.927	7

EMWS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.981	.981	21

RQ Dismissive Attachment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.651	.655	5

Item Statistics

	Mean	Std. Deviation	N
RQ2	3.90	1.192	73
RQ6	2.47	1.405	73
RQ19	3.86	1.273	73
RQ22	2.04	1.285	73
RQ26	3.30	1.440	73

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.275	.039	.650	.611	16.728	.033	5

Fearful Attachment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.714	.717	4

ER Re-appprаisal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.882	.884	6

ER Suppression

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.742	.731	4

Hyper-arousal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.855	.853	26

Reactive Hyper-arousal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.518	.513	3

Item Statistics

	Mean	Std. Deviation	N
HYP6	2.64	1.393	69
HYP12	2.83	1.200	69
HYP17	1.94	1.199	69

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.260	.136	.322	.186	2.371	.009	3

Self-Compassion

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.761	.766	26

Self-judgment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.845	.849	5

Isolation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.775	.774	4

Over-identification

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.732	.731	4

Self-kindness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.914	.914	5

Common Humanity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.808	.805	4

Mindfulness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.812	.818	4

SHAQ

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.957	.958	18

Multiple Regression Analysis - Pain

Pain and Psychosocial Variables - Total Scleroderma Sample

Descriptive Statistics

Mean	Std. Deviation	N
30.49	25.797	75
70.24	24.431	72
15.5753	4.27173	73

Correlations

		PAIN	Total EMWS 1	Total Dismissive RQ!
Pearson Correlation	PAIN	1.000	-.366	.281
	Total EMWS 1	-.366	1.000	-.120
	Total Dismissive RQ!	.281	-.120	1.000
Sig. (1-tailed)	PAIN	.	.001	.008
	Total EMWS 1	.001	.	.160
	Total Dismissive RQ!	.008	.160	.
N	PAIN	75	71	72
	Total EMWS 1	71	72	71
	Total Dismissive RQ!	72	71	73

Variables Entered/Removed[b]

Variables Entered	Variables Removed	Method
Total Dismissive RQ!, Total EMWS 1	.	Enter

a. All requested variables entered.

b. Dependent Variable: PAIN

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437[a]	.191	.167	23.537

a. Predictors: (Constant), Total Dismissive RQ!, Total EMWS 1 b. Dependent Variable: PAIN

ANOVA[b]

df	Mean Square	F	Sig.
2	4455.121	8.042	.001[a]
68	554.009		
70			

a. Predictors: (Constant), Total Dismissive RQ!, Total EMWS 1 b. Dependent Variable: PAIN

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	32.908	14.182		2.320	.023	4.609	61.208					
	Total EMWS 1	-.356	.116	-.338	-3.073	.003	-.588	-.125	-.366	-.349	-.335	.986	1.015
	Total Dismissive RQ!	1.452	.663	.241	2.190	.032	.129	2.776	.281	.257	.239	.986	1.015

a. Dependent Variable: PAIN

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Total EMWS 1	Total Dismissive RQ!
1	1	2.875	1.000	.00	.01	.01
	2	.100	5.362	.01	.61	.27
	3	.025	10.676	.99	.38	.72

a. Dependent Variable: PAIN

Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	9.98	59.93	30.34	11.355	71
Std. Predicted Value	-1.818	2.609	-.013	1.006	71
Standard Error of Predicted Value	2.823	8.894	4.686	1.314	71
Deleted Residual	-35.425	61.307	.390	24.372	70
Stud. Deleted Residual	-1.464	2.700	.020	1.025	70
Mahal. Distance	.021	9.010	2.003	1.764	71
Cook's Distance	.000	.234	.016	.031	70
Centered Leverage Value	.000	.129	.029	.025	71

MANOVA – Scleroderma Pain/No Pain Groups

Psychosocial Variables Descriptive Statistics

		N
Pain No/Yes	0	32
	1	38

	PainNoYes	Mean	Std. Deviation	N
Total EMWS 1	0	78.28	18.488	32
	1	63.04	26.611	38
	Total	70.01	24.327	70
Total Dismissive RQ!	0	14.1563	4.48013	32
	1	16.5789	3.90863	38
	Total	15.4714	4.32291	70

Box's Test of Equality of Covariance Matrices[a]

Box's M	6.000
F	1.936
df1	3
df2	72879047.111
Sig.	.121

Tests the null hypothesis that variables are equal across groups. a. Design: Intercept + PainNoYes

Multivariate Tests[b]

Box's M	6.000
F	1.936
df1	3
df2	72879047.111
Sig.	.121

Tests the null hypothesis that variables are equal across groups. a. Design: Intercept + PainNoYes

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.961	828.711[a]	2.000	67.000	.000	.961
	Wilks' Lambda	.039	828.711[a]	2.000	67.000	.000	.961
	Hotelling's Trace	24.738	828.711[a]	2.000	67.000	.000	.961
	Roy's Largest Root	24.738	828.711[a]	2.000	67.000	.000	.961
PainNoYes	Pillai's Trace	.156	6.175[a]	2.000	67.000	.003	.156
	Wilks' Lambda	.844	6.175[a]	2.000	67.000	.003	.156
	Hotelling's Trace	.184	6.175[a]	2.000	67.000	.003	.156
	Roy's Largest Root	.184	6.175[a]	2.000	67.000	.003	.156

a. Exact statistic

b. Design: Intercept + PainNoYes

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Total EMWS 1	5.984	1	68	.017
Total Dismissive RQ!	.769	1	68	.384

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Total EMWS 1	4035.587[a]	1	4035.587	7.457	.008	.099
	Total Dismissive RQ!	101.961[b]	1	101.961	5.839	.018	.079
Intercept	Total EMWS 1	346934.301	1	346934.301	641.098	.000	.904
	Total Dismissive RQ!	16409.961	1	16409.961	939.701	.000	.933
PainNoYes	Total EMWS 1	4035.587	1	4035.587	7.457	.008	.099
	Total Dismissive RQ!	101.961	1	101.961	5.839	.018	.079
Error	Total EMWS 1	36798.660	68	541.157			
	Total Dismissive RQ!	1187.482	68	17.463			
Total	Total EMWS 1	383904.250	70				
	Total Dismissive RQ!	18045.000	70				
Corrected Total	Total EMWS 1	40834.246	69				
	Total Dismissive RQ!	1289.443	69				

a. R Squared = .099 (Adjusted R Squared = .086)

b. R Squared = .079 (Adjusted R Squared = .066)

PainNoYes

Dependent Variable	PainNoYes	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Total EMWS 1	0	78.281	4.112	70.075	86.487
	1	63.039	3.774	55.509	70.570
Total Dismissive RQ!	0	14.156	.739	12.682	15.630
	1	16.579	.678	15.226	17.932

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	48.77	78.29	64.26	6.893	68
Std. Predicted Value	-2.295	2.060	-.009	1.017	68
Standard Error of Predicted Value	4.356	12.416	7.187	2.130	68
Adjusted Predicted Value	45.42	79.00	63.90	7.176	68
Residual	-66.328	66.445	7.387	36.273	68
Std. Residual	-1.870	1.873	.208	1.023	68
Stud. Residual	-1.899	1.934	.213	1.044	68
Deleted Residual	-68.395	70.826	7.742	37.815	68
Stud. Deleted Residual	-1.939	1.977	.215	1.053	68
Mahal. Distance	.025	7.225	2.003	1.816	68
Cook's Distance	.000	.083	.016	.019	68
Centered Leverage Value	.000	.108	.030	.027	68

Multiple Regression Analysis: Raynaud's and Psychosocial Variables - Total Sample

Descriptive Statistics

	Mean	Std. Deviation	N
Raynauds	29.49	26.279	75
Self Kindness Transformed Log	1.1056	.17510	69
Hyperarousal Reactive	7.4058	2.71336	69

Correlations

		Raynaud	Self Kindness Transformed Log	Hyperarousal Reactive
Pearson Correlation	Raynauds	1.000	-.354	.361
	Self Kindness Transformed Log	-.354	1.000	-.232
	Hyperarousal Reactive	.361	-.232	1.000
Sig. (1-tailed)	Raynauds	.	.002	.001
	Self Kindness Transformed Log	.002	.	.028
	Hyperarousal Reactive	.001	.028	.
N	Raynauds	75	68	68
	Self Kindness Transformed Log	68	69	69
	Hyperarousal Reactive	68	69	69

Variables Entered

Model	Variables Entered	Variables Removed	Method
1	Hyperarousal Reactive, Self Kindness Transformed Log	.	Enter

a. All requested variables entered.

b. Dependent Variable: Raynauds

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.455[a]	.207	.183	23.757

a. Predictors: (Constant), Hyperarousal Reactive, Self Kindness Transformed Log b. Dependent Variable: Raynauds

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9583.254	2	4791.627	8.490	.001[a]
	Residual	36685.449	65	564.392		
	Total	46268.703	67			

a. Predictors: (Constant), Hyperarousal Reactive, Self Kindness Transformed Log

b. Dependent Variable: Raynauds

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	55.700	22.374		2.489	.015	11.015	100.384					
	Self Kindness Transformed Log	-42.815	17.039	-.285	-2.513	.014	-76.845	-8.785	-.354	-.298	-.278	.946	1.057
	Hyperarousal Reactive	2.853	1.100	.295	2.595	.012	.657	5.049	.361	.306	.287	.946	1.057

a. Dependent Variable: Raynauds

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Self Kindness Transformed Log	Hyperarousal Reactive
1	1	2.896	1.000	.00	.00	.01
	2	.094	5.548	.01	.06	.77
	3	.010	17.204	.98	.93	.22

a. Dependent Variable: Raynauds

Residuals Statistics[a]	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	10.50	68.57	29.49	11.960	69
Std. Predicted Value	-1.588	3.267	.000	1.000	69
Standard Error of Predicted Value	2.914	9.961	4.779	1.448	69
Adjusted Predicted Value	9.93	72.53	29.32	12.188	68
Residual	-48.047	49.917	-.360	23.234	68
Std. Residual	-2.022	2.101	-.015	.978	68
Stud. Residual	-2.079	2.246	-.014	1.001	68
Deleted Residual	-50.770	57.020	-.322	24.345	68
Stud. Deleted Residual	-2.135	2.320	-.012	1.012	68
Mahal. Distance	.023	10.793	1.971	1.988	69
Cook's Distance	.000	.239	.016	.032	68
Centered Leverage Value	.000	.161	.029	.030	69

MANOVA: Skin Severity - Mild Moderate Severe Groups

Between-Subjects Factors		N
Tight Skin Severity Groups	1.00	12
	2.00	23
	3.00	25

Descriptive Statistics	Tight Skin Severity Groups	Mean	Std. Deviation	N
Total EMWS 1	1.00	70.83	23.866	12
	2.00	77.22	18.940	23
	3.00	61.72	28.926	25
	Total	69.48	25.091	60
Total Dismissive RQ!	1.00	13.8333	5.00606	12
	2.00	14.1739	4.23891	23
	3.00	17.6000	3.93700	25
	Total	15.5333	4.56021	60
Transformed Log Fear RQ	1.00	.8167	.14774	12
	2.00	.9241	.16153	23
	3.00	.9963	.17349	25
	Total	.9327	.17469	60
Transformed Sqare Root Suppression ERQ1	1.00	3.0673	.90941	12
	2.00	3.8759	.58318	23
	3.00	3.7824	.87386	25
	Total	3.6752	.82908	60

Box's Test of Equality of Covariance Matrices[a]

Box's M	30.338
F	1.336
df1	20
df2	4988.845
Sig.	.144

a. Design: Intercept TightSkinSvgps

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.982	753.612[a]	4.000	54.000	.000	.982
	Wilks' Lambda	.018	753.612[a]	4.000	54.000	.000	.982
	Hotelling's Trace	55.823	753.612[a]	4.000	54.000	.000	.982
	Roy's Largest Root	55.823	753.612[a]	4.000	54.000	.000	.982
TightSkinSvgps	Pillai's Trace	.387	3.299	8.000	110.000	.002	.194
	Wilks' Lambda	.650	3.240[a]	8.000	108.000	.002	.194
	Hotelling's Trace	.480	3.180	8.000	106.000	.003	.194
	Roy's Largest Root	.249	3.428[b]	4.000	55.000	.014	.200

a. Exact statistic b. The statistic is an upper bound on F that yields a lower bound on the significance level. c. Design: Intercept + TightSkinSvgps

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Total EMWS 1	3.773	2	57	.029
Total Dismissive RQ!	1.676	2	57	.196
Transformed Log Fear RQ	.458	2	57	.635
Transformed Sqare Root	2.275	2	57	.112
Suppression ERQ1				

. a. Design: Intercept + TightSkinSvgps

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Total EMWS 1	2904.364[a]	2	1452.182	2.418	.098	.078
	Total Dismissive RQ!	183.962[b]	2	91.981	5.027	.010	.150
	Transformed Log Fear RQ	.264[c]	2	.132	4.897	.011	.147
	Transformed Sqare Root Suppression ERQ1	5.648[d]	2	2.824	4.611	.014	.139
Intercept	Total EMWS 1	263793.156	1	263793.156	439.159	.000	.885
	Total Dismissive RQ!	12469.283	1	12469.283	681.466	.000	.923
	Transformed Log Fear RQ	44.912	1	44.912	1666.144	.000	.967
	Transformed Sqare Root Suppression ERQ1	689.641	1	689.641	1126.128	.000	.952
TightSkinSvgps	Total EMWS 1	2904.364	2	1452.182	2.418	.098	.078
	Total Dismissive RQ!	183.962	2	91.981	5.027	.010	.150
	Transformed Log Fear RQ	.264	2	.132	4.897	.011	.147
	Transformed Sqare Root Suppression ERQ1	5.648	2	2.824	4.611	.014	.139
Error	Total EMWS 1	34238.620	57	600.678			
	Total Dismissive RQ!	1042.971	57	18.298			
	Transformed Log Fear RQ	1.536	57	.027			
	Transformed Sqare Root Suppression ERQ1	34.907	57	.612			
Total	Total EMWS 1	326819.000	60				
	Total Dismissive RQ!	15704.000	60				
	Transformed Log Fear RQ	53.997	60				
	Transformed Sqare Root Suppression ERQ1	851.000	60				
Corrected Total	Total EMWS 1	37142.983	59				
	Total Dismissive RQ!	1226.933	59				
	Transformed Log Fear RQ	1.800	59				
	Transformed Sqare Root Suppression ERQ1	40.555	59				

a. R Squared = .078 (Adjusted R Squared = .046) b. R Squared = .150 (Adjusted R Squared = .120) c. R Squared = .147 (Adjusted R Squared = .117) d. R Squared = .139 (Adjusted R Squared = .109)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	44.03	91.49	69.05	11.253	64
Std. Predicted Value	-2.224	1.995	.000	1.000	64
Standard Error of Predicted Value	8.145	19.956	13.750	2.532	64
Adjusted Predicted Value	40.04	109.18	69.41	13.628	64
Residual	-69.327	63.663	.000	34.826	64
Std. Residual	-1.860	1.708	.000	.934	64
Stud. Residual	-2.202	1.783	-.004	1.010	64
Deleted Residual	-97.185	73.623	-.363	40.801	64
Stud. Deleted Residual	-2.285	1.820	-.006	1.021	64
Mahal. Distance	2.024	17.074	7.875	3.226	64
Cook's Distance	.000	.217	.020	.032	64
Centered Leverage Value	.032	.271	.125	.051	64

a. Dependent Variable: ID

Statistical Analysis – Scleroderma: Depression, Anxiety and Stress

Multiple Regression Analysis - Depression

Scleroderma: Depression and Psychosocial Variables - Total Sample

Descriptive Statistics

	Mean	Std. Deviation	N
Transform Inverse Depression DASS 1	.0975	.03081	75
Total EMWS 1	70.24	24.431	72
Raynauds	1.06	.248	77
Transformed Log Fear RQ	.9310	.16629	73

Correlations

		Transform Inverse Depression DASS 1	Total EMWS 1	Raynauds	Transformed Log Fear RQ
Pearson Correlation	Transform Inverse Depression DASS 1	1.000	.391	.136	-.361
	Total EMWS 1	.391	1.000	.099	-.279
	Raynauds	.136	.099	1.000	.068
	Transformed Log Fear RQ	-.361	-.279	.068	1.000
Sig. (1-tailed)	Transform Inverse Depression DASS 1	.	.000	.123	.001
	Total EMWS 1	.000	.	.205	.009
	Raynauds	.123	.205	.	.286
	Transformed Log Fear RQ	.001	.009	.286	.
N	Transform Inverse Depression DASS 1	75	72	74	72
	Total EMWS 1	72	72	72	71
	Raynauds	74	72	77	72
	Transformed Log Fear RQ	72	71	72	73

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Transformed Log Fear RQ, Raynauds , Total EMWS 1[b]	.	Enter

a. Dependent Variable: Transform Inverse Depression DASS 1

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.488[a]	.238	.204	.02750

a. Predictors: (Constant), Transformed Log Fear RQ, Raynauds , Total EMWS

b. Dependent Variable: Transform Inverse Depression DASS 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.016	3	.005	6.968	.000[b]
	Residual	.051	67	.001		
	Total	.066	70			

a. Dependent Variable: Transform Inverse Depression DASS 1

b. Predictors: (Constant), Transformed Log Fear RQ, Raynauds , Total EMWS 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Sta	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	
1	(Constant)	.104	.027		3.913	.000	.051	.157					
	Total EMWS 1	.000	.000	.299	2.673	.009	.000	.001	.391	.310	.285	.909	
	Raynauds	.016	.013	.126	1.172	.245	-.011	.042	.136	.142	.125	.980	
	Transformed Log Fear RQ	-.053	.021	-.287	-2.568	.012	-.094	-.012	-.361	-.299	-.274	.913	

a. Dependent Variable: Transform Inverse Depression DASS 1

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Total EMWS 1	Raynauds	Transformed Log Fear RQ
1	1	3.855	1.000	.00	.01	.00	.00
	2	.096	6.341	.00	.73	.03	.06
	3	.039	9.985	.02	.02	.87	.19
	4	.010	19.217	.98	.24	.10	.75

a. Dependent Variable: Transform Inverse Depression DASS 1

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0583	.1284	.0978	.01516	71
Std. Predicted Value	-2.612	2.057	.016	1.009	71
Standard Error of Predicted Value	.003	.015	.006	.003	71
Adjusted Predicted Value	.0597	.1411	.0978	.01564	71
Residual	-.05144	.06964	-.00014	.02662	71
Std. Residual	-1.871	2.533	-.005	.968	71
Stud. Residual	-1.888	2.609	-.006	1.000	71
Deleted Residual	-.05240	.07391	-.00022	.02849	71
Stud. Deleted Residual	-1.926	2.732	-.006	1.012	71
Mahal. Distance	.105	20.667	3.065	4.014	71
Cook's Distance	.000	.214	.018	.037	71
Centered Leverage Value	.002	.295	.044	.057	71

a. Dependent Variable: Transform Inverse Depression DASS 1

Multiple Regression Analysis: Depression and Psychosocial/ Scleroderma Variables – Limited Sclerosis

Descriptive Statistics

Sclero Limited		Mean	Std. Deviation	N
1.00	Transform Inverse Depression DASS 1	.0963	.02934	42
	Total EMWS 1	73.03	21.888	40
	Transformed Sqare Root Suppression ERQ1	3.6629	.71952	38

Correlations

Sclero Limited			Transform Inverse Depression DASS 1	Total EMWS 1	Transformed Sqare Root Suppression ERQ1
1.00	Pearson Correlation	Transform Inverse Depression DASS 1	1.000	.496	-.478
		Total EMWS 1	.496	1.000	-.098
		Transformed Sqare Root Suppression ERQ1	-.478	-.098	1.000
	Sig. (1-tailed)	Transform Inverse Depression DASS 1	.	.001	.001
		Total EMWS 1	.001	.	.283
		Transformed Sqare Root Suppression ERQ1	.001	.283	.

N	Transform Inverse Depression DASS 1	42	40	38
	Total EMWS 1	40	40	37
	Transformed Sqare Root Suppression ERQ1	38	37	38

Variables Entered/Removed[b]

Sclero Limited	Model	Variables Entered	Variables Removed	Method
1.00	1	Transformed Sqare Root Suppression ERQ1, Total EMWS 1	.	Enter

Model Summary[b]

Sclero Limited	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.00	1	.658[a]	.433	.399	.02274

a. Predictors: (Constant), Transformed Sqare Root Suppression ERQ1, Total EMWS 1

b. Dependent Variable: Transform Inverse Depression DASS 1

ANOVA[b]

Sclero Limited	Model		Sum of Squares	df	Mean Square	F	Sig.
1.00	1	Regression	.013	2	.007	12.970	.000[a]
		Residual	.018	34	.001		
		Total	.031	36			

a. Predictors: (Constant), Transformed Sqare Root Suppression ERQ1, Total EMWS 1

b. Dependent Variable: Transform Inverse Depression DASS 1

Coefficients[a]

			Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Sclero Limited	Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1.00	1	(Constant)	.117	.024		4.765	.000	.067	.166					
		Total EMWS 1	.001	.000	.454	3.499	.001	.000	.001	.496	.515	.452	.990	
		Transformed Square Root Suppression ERQ1	-.018	.005	-.434	-3.342	.002	-.028	-.007	-.478	-.497	-.432	.990	

a. Dependent Variable: Transform Inverse Depression DASS 1

Collinearity Diagnostics[a]

Sclero Limited	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
					(Constant)	Total EMWS 1	Transformed Sqare Root Suppression ERQ1
1.00	1	1	2.918	1.000	.00	.01	.00
		2	.067	6.586	.01	.74	.18
		3	.015	14.100	.98	.25	.82

a. Dependent Variable: Transform Inverse Depression DASS 1

Residuals Statistics[a]

Sclero Limited		Minimum	Maximum	Mean	Std. Deviation	N
1.00	Predicted Value	.0471	.1361	.0964	.01931	37
	Std. Predicted Value	-2.551	2.059	.003	1.001	37
	Standard Error of Predicted Value	.004	.011	.006	.002	37
	Adjusted Predicted Value	.0499	.1345	.0967	.01908	37
	Residual	-.04905	.06378	-.00039	.02167	37
	Std. Residual	-2.157	2.805	-.017	.953	37
	Stud. Residual	-2.207	2.903	-.023	.986	37
	Deleted Residual	-.05136	.06831	-.00069	.02321	37
	Stud. Deleted Residual	-2.350	3.298	-.015	1.033	37
	Mahal. Distance	.009	6.890	1.949	1.760	37
	Cook's Distance	.000	.199	.023	.036	37
	Centered Leverage Value	.000	.191	.054	.049	37

a. Dependent Variable: Transform Inverse Depression DASS 1

Multiple Regression Analysis: Diffuse - Depression

Descriptive Statistics[a]

	Mean	Std. Deviation	N
Transform Inverse Depression DASS 1	.0990	.03299	33
OverIdentification SC	10.9677	3.70121	31
Raynaud	31.88	29.099	34

a. Diffuse Limited Sclerodema = Diffuse

Correlations[a]

Correlations		Transform Inverse Depression DASS 1	OverIdentification SC	Raynaud
Pearson Correlation	Transform Inverse Depression DASS 1	1.000	-.549	-.513
	OverIdentification SC	-.549	1.000	-.321
	Raynaud	-.513	-.321	1.000
Sig. (1-tailed)	Transform Inverse Depression DASS 1	.	.001	.001
	OverIdentification SC	.001	.	.039
	Raynaud	.001	.039	.
N	Transform Inverse Depression DASS 1	33	30	33
	OverIdentification SC	30	31	31
	Raynaud	33	31	34

a. Diffuse Limited Sclerodema = Diffuse

Variables Entered/Removed[a,b]

Model	Variables Entered	Variables Removed	Method
1	Raynaud, OverIdentification SC[c]	.	Enter

a. Diffuse Limited Sclerodema = Diffuse

b. Dependent Variable: Transform Inverse Depression DASS 1

c. All requested variables entered.

Model Summary[a,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[b]	.428	.386	.02586

a. Diffuse Limited Sclerodema = Diffuse

b. Predictors: (Constant), Raynaud, OverIdentification SC

c. Dependent Variable: Transform Inverse Depression DASS 1

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.014	2	.007	10.106	.001[c]
	Residual	.018	27	.001		
	Total	.032	29			

a. Diffuse Limited Sclerodema = Diffuse

b. Dependent Variable: Transform Inverse Depression DASS 1

c. Predictors: (Constant), Raynaud, OverIdentification SC

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.155	.015		10.297	.000	.124	.185					
	OverIdentification SC	-.004	.001	-.429	-2.792	.009	-.007	-.001	-.549	-.473	-.406	.897	1.115
	Raynaud	.000	.000	-.375	-2.441	.021	-.001	.000	-.513	-.425	-.355	.897	1.115

a. Diffuse Limited Sclerodema = Diffuse

b. Dependent Variable: Transform Inverse Depression DASS 1

Collinearity Diagnostics[a,b]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	OverIdentification SC	Raynaud
1	1	2.648	1.000	.01	.01	.05
	2	.302	2.961	.06	.03	.93
	3	.050	7.307	.93	.95	.03

a. Diffuse Limited Sclerodema = Diffuse

b. Dependent Variable: Transform Inverse Depression DASS 1

Residuals Statistics[a,b]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0440	.1354	.0981	.02170	31
Std. Predicted Value	-2.548	1.685	-.045	1.005	31
Standard Error of Predicted Value	.005	.013	.008	.002	31
Adjusted Predicted Value	.0340	.1342	.0966	.02284	30
Residual	-.04769	.04698	.00023	.02553	30
Std. Residual	-1.844	1.817	.009	.988	30
Stud. Residual	-1.918	2.034	.022	1.048	30
Deleted Residual	-.05159	.05889	.00098	.02884	30
Stud. Deleted Residual	-2.026	2.169	.020	1.075	30
Mahal. Distance	.077	6.800	1.965	1.760	31
Cook's Distance	.000	.350	.047	.073	30
Centered Leverage Value	.003	.234	.068	.061	31

a. Diffuse Limited Sclerodema = Diffuse

b. Dependent Variable: Transform Inverse Depression DASS 1

Mann Witney U-Test: Finger Ulcers - Depression

Depression - Finger Ulcers and No Finger Ulcer Groups

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Transform Inverse Depression DASS 1	75	.0975	.03081	.04	.14
FingerUlcrNY	76	.5921	.49471	.00	1.00

Ranks

	FingerUlcrNY	N	Mean Rank	Sum of Ranks
Transform Inverse Depression DASS 1	.00	30	45.45	1363.50
	1.00	45	33.03	1486.50
	Total	75		

Test Statistics[a]

	Transform Inverse Depression DASS 1
Mann-Whitney U	451.500
Wilcoxon W	1486.500
Z	-2.438
Asymp. Sig. (2-tailed)	.015

a. Grouping Variable: FingerUlcrNY

Medium Scores

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Transform Inverse Depression DASS 1 * FingerUlcrNY	75	58.1%	54	41.9%	129	100.0%

Report

Transform Inverse Depression DASS 1

FingerUlcrNY	N	Median
.00	30	.1250
1.00	45	.0909
Total	75	.1000

Multiple Regression Analysis - Anxiety

Anxiety and Psychosocial and Scleroderma Variables - Total Sample

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed Log Anxiety	1.0175	.13186	76
Total EMWS 1	70.24	24.431	72
Transformed Sqare Root Suppression ERQ1	3.7001	.80731	69
Transformed SQRT Breathing 1SHAQ	3.6189	2.92497	76

Correlations

		Transformed Log Anxiety	Total EMWS 1	Transformed Sqare Root Suppression ERQ1	Transformed SQRT Breathing 1SHAQ
Pearson Correlation	Transformed Log Anxiety	1.000	-.468	.325	.418
	Total EMWS 1	-.468	1.000	.068	-.067
	Transformed Sqare Root Suppression ERQ1	.325	.068	1.000	-.078
	Transformed SQRT Breathing 1SHAQ	.418	-.067	-.078	1.000
Sig. (1-tailed)	Transformed Log Anxiety	.	.000	.003	.000
	Total EMWS 1	.000	.	.292	.288
	Transformed Sqare Root Suppression ERQ1	.003	.292	.	.263
	Transformed SQRT Breathing 1SHAQ	.000	.288	.263	.
N	Transformed Log Anxiety	76	72	69	76
	Total EMWS 1	72	72	66	72
	Transformed Sqare Root Suppression ERQ1	69	66	69	69
	Transformed SQRT Breathing 1SHAQ	76	72	69	76

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Transformed SQRT Breathing 1SHAQ, Total EMWS 1, Transformed Sqare Root Suppression ERQ1	.	Enter

a. b. Dependent Variable: Transformed Log Anxiety

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.721[a]	.520	.496	.09359

a. Predictors: (Constant), Transformed SQRT Breathing 1SHAQ, Total EMWS 1, Transformed Sqare Root Suppression ERQ1 b. Dependent Variable: Transformed Log Anxiety

b.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.587	3	.196	22.345	.000[a]
	Residual	.543	62	.009		
	Total	1.130	65			

a. Predictors: (Constant), Transformed SQRT Breathing 1SHAQ, Total EMWS 1, Transformed Sqare Root Suppression ERQ1 b. Dependent Variable: Transformed Log Anxiety

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.891	.065		13.640	.000	.761	1.022					
	Total EMWS 1	-.003	.000	-.467	-5.279	.000	-.003	-.002	-.468	-.557	-.465	.991	1.009
	Transformed Sqare Root Suppression ERQ1	.064	.014	.389	4.398	.000	.035	.092	.325	.488	.387	.990	1.010
	Transformed SQRT Breathing 1SHAQ	.019	.004	.417	4.718	.000	.011	.027	.418	.514	.415	.990	1.010

a. Dependent Variable: Transformed Log Anxiety

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Total EMWS 1	Transformed Sqare Root Suppression ERQ1	Transformed SQRT Breathing 1SHAQ
1	1	3.563	1.000	.00	.01	.00	.02
	2	.341	3.235	.00	.03	.01	.90
	3	.077	6.822	.03	.85	.18	.02
	4	.020	13.414	.96	.11	.81	.06

a. Dependent Variable: Transformed Log Anxiety

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.8104	1.2682	1.0146	.09615	66
Std. Predicted Value	-2.179	2.638	-.030	1.012	66
Standard Error of Predicted Value	.012	.037	.023	.006	66
Adjusted Predicted Value	.8060	1.2576	1.0143	.09638	66
Residual	-.18428	.18756	-.00126	.09082	66
Std. Residual	-1.969	2.004	-.013	.970	66
Stud. Residual	-2.013	2.063	-.012	.997	66
Mahal. Distance	.127	9.429	3.020	2.106	66
Cook's Distance	.000	.063	.014	.015	66
Centered Leverage Value	.002	.145	.046	.032	66

a. Dependent Variable: Transformed Log Anxiety

Multiple Regression Analysis: Limited and Diffuse - Anxiety and Psychosocial and Scleroderma Variables

Limited Sclerosis

Descriptive Statistics

Sclero Limited		Mean	Std. Deviation	N
1.00	Transformed Log Anxiety	1.0025	.13589	42
	Total EMWS 1	73.03	21.888	40
	Transformed SQRT Breathing 1SHAQ	3.5047	2.90966	42
	Transformed Sqare Root Suppression ERQ1	3.6629	.71952	38

Correlations

Sclero Limited			Transformed Log Anxiety	Total EMWS 1	Transformed SQRT Breathing 1SHAQ	Transformed Sqare Root Suppression ERQ1
1.00	Pearson Correlation	Transformed Log Anxiety	1.000	-.510	.464	.446
		Total EMWS 1	-.510	1.000	.129	-.098
		Transformed SQRT Breathing 1SHAQ	.464	.129	1.000	.223
		Transformed Sqare Root Suppression ERQ1	.446	-.098	.223	1.000
	Sig. (1-tailed)	Transformed Log Anxiety	.	.000	.001	.002
		Total EMWS 1	.000	.	.213	.283
		Transformed SQRT Breathing 1SHAQ	.001	.213	.	.089
		Transformed Sqare Root Suppression ERQ1	.002	.283	.089	.
	N	Transformed Log Anxiety	42	40	42	38
		Total EMWS 1	40	40	40	37
		Transformed SQRT Breathing 1SHAQ	42	40	42	38
		Transformed Sqare Root Suppression ERQ1	38	37	38	38

Variables Entered/Removed[b]

Sclero Limited	Model	Variables Entered	Variables Removed	Method
1.00	1	Transformed Sqare Root Suppression ERQ1, Total EMWS 1, Transformed SQRT Breathing 1SHAQ	.	Enter

a. All requested variables entered.

b. Dependent Variable: Transformed Log Anxiety

Model Summary[b]

Sclero Limited	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.00	1	.790[a]	.623	.589	.08709

a. Predictors: (Constant), Transformed Sqare Root Suppression ERQ1, Total EMWS 1, Transformed SQRT Breathing 1SHAQ b. Dependent Variable: Transformed Log Anxiety

ANOVA[b]

Sclero Limited	Model		Sum of Squares	df	Mean Square	F	Sig.
1.00	1	Regression	.414	3	.138	18.216	.000[a]
		Residual	.250	33	.008		
		Total	.665	36			

a. Predictors: (Constant), Transformed Sqare Root Suppression ERQ1, Total EMWS 1, Transformed SQRT Breathing 1SHAQ

b. Dependent Variable: Transformed Log Anxiety

Coefficients[a]

Sclero Limited	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1.00	1	(Constant)	.972	.094		10.330	.000	.780	1.163					
		Total EMWS 1	-.003	.001	-.543	-4.993	.000	-.005	-.002	-.510	-.656	-.533	.966	1.035
		Transformed SQRT Breathing 1SHAQ	.022	.005	.470	4.235	.000	.011	.032	.464	.593	.452	.927	1.079
		Transformed Sqare Root Suppression ERQ1	.055	.021	.289	2.611	.013	.012	.097	.446	.414	.279	.934	1.071

a. Dependent Variable: Transformed Log Anxiety

Collinearity Diagnostics[a]

Sclero Limited	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
					(Constant)	Total EMWS 1	Transformed SQRT Breathing 1SHAQ	Transformed Sqare Root Suppression ERQ1
1.00	1	1	3.609	1.000	.00	.01	.02	.00
		2	.310	3.414	.01	.02	.95	.01
		3	.067	7.336	.02	.71	.00	.17
		4	.014	15.884	.98	.26	.03	.82

a. Dependent Variable: Transformed Log Anxiety

Residuals Statistics[a]

Sclero Limited		Minimum	Maximum	Mean	Std. Deviation	N
1.00	Predicted Value	.7997	1.3102	.9977	.10778	37
	Std. Predicted Value	-1.890	2.867	-.044	1.004	37
	Standard Error of Predicted Value	.016	.045	.028	.007	37
	Adjusted Predicted Value	.7891	1.2984	.9973	.10729	37
	Residual	-.19437	.17341	-.00531	.08371	37
	Std. Residual	-2.232	1.991	-.061	.961	37
	Stud. Residual	-2.328	2.050	-.059	1.006	37
	Deleted Residual	-.21155	.18381	-.00485	.09179	37
	Stud. Deleted Residual	-2.508	2.161	-.068	1.040	37
	Mahal. Distance	.179	8.617	2.942	2.130	37
	Cook's Distance	.000	.120	.024	.031	37
	Centered Leverage Value	.005	.239	.082	.059	37

a. Dependent Variable: Transformed Log Anxiety

Multiple Regression Analysis: Diffuse Sclerosis – Anxiety

Descriptive Statistics

Sclero Diffuse		Mean	Std. Deviation	N
1.00	Transformed Log Anxiety	1.0360	.12623	34
	Total EMWS 1	66.77	27.237	32
	SC Isolation	10.3226	4.36186	31

Correlations

Sclero Diffuse			Transformed Log Anxiety	Total EMWS 1	SC Isolation
1.00	Pearson Correlation	Transformed Log Anxiety	1.000	-.415	.383
		Total EMWS 1	-.415	1.000	.097
		SC Isolation	.383	.097	1.000
	Sig. (1-tailed)	Transformed Log Anxiety	.	.009	.017
		Total EMWS 1	.009	.	.309
		SC Isolation	.017	.309	.
	N	Transformed Log Anxiety	34	32	31
		Total EMWS 1	32	32	29
		SC Isolation	31	29	31

Variables Entered/Removed[b]

Sclero Diffuse	Model	Variables Entered	Variables Removed	Method
1.00	1	SC Isolation, Total EMWS 1	.	Enter

a. All requested variables entered. b. Dependent Variable: Transformed Log Anxiety

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate
.594[a]	.352	.303	.10541

ANOVA

Sclero Diffuse	Model		Sum of Squares	df	Mean Square	F	Sig.
1.00	1	Regression	.157	2	.079	7.074	.004[a]
		Residual	.289	26	.011		
		Total	.446	28			

a. Predictors: (Constant), SC Isolation, Total EMWS 1 b. Dependent Variable: Transformed Log Anxiety

Coefficients

Sclero Diffuse	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1.00	1	(Constant)	1.049	.068		15.499	.000	.910	1.189					
		Total EMWS 1	-.002	.001	-.456	-2.874	.008	-.004	-.001	-.415	-.491	-.454	.991	1.009
		SC Isolation	.012	.005	.427	2.692	.012	.003	.022	.383	.467	.425	.991	1.009

a. Dependent Variable: Transformed Log Anxiety

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed Log Anxiety	1.0175	.13186	76
Total EMWS 1	70.24	24.431	72
Transformed Sqare Root Suppression ERQ1	3.7001	.80731	69
Transformed SQRT Breathing 1SHAQ	3.6189	2.92497	76

Sclero Diffuse	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
					(Constant)	Total EMWS 1	SC Isolation
1.00	1	1	2.815	1.000	.01	.02	.02
		2	.129	4.670	.00	.51	.59
		3	.055	7.123	.99	.48	.39

a. Dependent Variable: Transformed Log Anxiety

Sclero Diffuse		Minimum	Maximum	Mean	Std. Deviation	N
1.00	Predicted Value	.9163	1.1744	1.0388	.07576	29
	Std. Predicted Value	-1.597	1.847	.037	1.011	29
	Standard Error of Predicted Value	.020	.049	.033	.008	29
	Adjusted Predicted Value	.9135	1.1578	1.0370	.07523	29
	Residual	-.16886	.20977	.00135	.09026	29
	Std. Residual	-1.602	1.990	.013	.856	29
	Stud. Residual	-1.657	2.096	.021	.904	29
	Deleted Residual	-.18074	.23261	.00315	.10070	29
	Stud. Deleted Residual	-1.718	2.254	.024	.925	29
	Mahal. Distance	.013	5.023	1.974	1.373	29
	Cook's Distance	.000	.159	.031	.041	29
	Centered Leverage Value	.000	.179	.070	.049	29

Sclero Diffuse	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
					(Constant)	Total EMWS 1	SC Isolation
1.00	1	1	2.815	1.000	.01	.02	.02
		2	.129	4.670	.00	.51	.59
		3	.055	7.123	.99	.48	.39

a. Dependent Variable: Transformed Log Anxiety

T-Tests - Anxiety

Anxiety – Pain and No Pain Groups

Group Statistics

	PainNoYes	N	Mean	Std. Deviation	Std. Error Mean
Transformed Log Anxiety	0	35	.9782	.11509	.01945
	1	40	1.0494	.13863	.02192

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Transformed Log Anxiety	Equal variances assumed	2.275	.136	-2.401	73	.019	-.07123	.02967	-.13037	-.01209
	Equal variances not assumed			-2.431	72.815	.018	-.07123	.02931	-.12965	-.01282

Multiple Regression Analysis: Scleroderma - Stress

Stress and Psychosocial and Scleroderma Variables - Total Sample

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed Logarithm Stress DASS 1	1.0585	.12737	75
Total EMWS 1	70.24	24.431	72
Total Self Compassion	79.3871	17.40770	62
AgeDiagRaynds	46.68	11.529	38

Correlations

Correlations		Transformed Logarithm Stress DASS 1	Total EMWS 1	Total Self Compassion	AgeDiagRaynds
Pearson Correlation	Transformed Logarithm Stress DASS 1	1.000	-.364	-.382	-.365
	Total EMWS 1	-.364	1.000	.292	-.099
	Total Self Compassion	-.382	.292	1.000	.204
	AgeDiagRaynds	-.365	-.099	.204	1.000
Sig. (1-tailed)	Transformed Logarithm Stress DASS 1	.	.001	.001	.013
	Total EMWS 1	.001	.	.012	.283
	Total Self Compassion	.001	.012	.	.140
	AgeDiagRaynds	.013	.283	.140	.
N	Transformed Logarithm Stress DASS 1	75	72	61	37
	Total EMWS 1	72	72	60	36
	Total Self Compassion	61	60	62	30
	AgeDiagRaynds	37	36	30	38

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	AgeDiagRaynds, Total EMWS 1, Total Self Compassion[b]	.	Enter

a. Dependent Variable: Transformed Logarithm Stress DASS 1

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.577[a]	.333	.256	.10983

a. Predictors: (Constant), AgeDiagRaynds, Total EMWS 1, Total Self Compassion

b. Dependent Variable: Transformed Logarithm Stress DASS 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.157	3	.052	4.335	.013[b]
	Residual	.314	26	.012		
	Total	.470	29			

a. Dependent Variable: Transformed Logarithm Stress DASS 1

b. Predictors: (Constant), AgeDiagRaynds, Total EMWS 1, Total Self Compassion

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.488	.124		12.045	.000	1.234	1.742					
	Total EMWS 1	-.002	.001	-.337	-1.986	.058	-.004	.000	-.364	-.363	-.318	.889	
	Total Self Compassion	-.002	.001	-.211	-1.223	.232	-.004	.001	-.382	-.233	-.196	.860	
	AgeDiagRaynds	-.004	.002	-.356	-2.145	.042	-.008	.000	-.365	-.388	-.343	.931	

a. Dependent Variable: Transformed Logarithm Stress DASS 1

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Total EMWS 1	Total Self Compassion	AgeDiagRaynds
1	1	3.857	1.000	.00	.01	.00	.00
	2	.092	6.484	.01	.66	.00	.18
	3	.033	10.863	.01	.27	.69	.49
	4	.019	14.217	.99	.07	.31	.32

a. Dependent Variable: Transformed Logarithm Stress DASS 1

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.9172	1.2094	1.0768	.06549	29
Std. Predicted Value	-1.922	2.052	.249	.890	29
Standard Error of Predicted Value	.023	.083	.037	.012	29
Adjusted Predicted Value	.8861	1.2925	1.0716	.07492	29
Residual	-.30633	.16223	.00533	.10592	29
Std. Residual	-2.789	1.477	.048	.964	29
Stud. Residual	-3.145	1.611	.068	1.058	29
Deleted Residual	-.38940	.21203	.01052	.12924	29
Stud. Deleted Residual	-3.917	1.665	.046	1.158	29
Mahal. Distance	.267	15.488	2.595	2.936	29
Cook's Distance	.000	.670	.065	.154	29
Centered Leverage Value	.009	.534	.089	.101	29

a. Dependent Variable: Transformed Logarithm Stress DASS 1

T-Tests - Stress

Stress – Intestinal and No Intestinal Groups

Group Statistics

	IntestinalNY	N	Mean	Std. Deviation	Std. Error Mean
Transformed Logarithm Stress DASS 1	.00	24	1.0135	.12569	.02566
	1.00	51	1.0797	.12374	.01733

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Transformed Logarithm Stress DASS 1	Equal variances assumed	.041	.840	-2.150	73	.035	-.06619	.03078	-.12754	-.00483
	Equal variances not assumed			-2.138	44.506	.038	-.06619	.03096	-.12856	-.00381

T-Tests and MANOVA – Depression, Anxiety and Stress

Depression, Anxiety and Stress – Raynaud's and No Raynaud's Groups

T-Tests

T-Test

Group Statistics

	RaynaudsNY	N	Mean	Std. Deviation	Std. Error Mean
Transform Inverse Depression DASS 1	.00	14	.1172	.02238	.00598
	1.00	60	.0930	.03109	.00401
Transformed Logarithm Stress DASS 1	.00	15	.9670	.11570	.02987
	1.00	59	1.0809	.12140	.01580
Transformed Log Anxiety	.00	15	.9521	.13236	.03417
	1.00	60	1.0328	.12868	.01661

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Diffe
									Lower
Transform Inverse Depression DASS 1	Equal variances assumed	2.567	.113	2.746	72	.008	.02422	.00882	.00664
	Equal variances not assumed			3.362	26.181	.002	.02422	.00720	.00942
Transformed Logarithm Stress DASS 1	Equal variances assumed	.179	.674	-3.274	72	.002	-.11392	.03479	-.18327
	Equal variances not assumed			-3.371	22.508	.003	-.11392	.03380	-.18392
Transformed Log Anxiety	Equal variances assumed	.030	.863	-2.159	73	.034	-.08063	.03735	-.15508
	Equal variances not assumed			-2.122	21.118	.046	-.08063	.03800	-.15963

MANOVA - Depression Anxiety Stress: Raynaud's/No Raynaud's

		N
RaynaudsNY	.00	14
	1.00	59

	RaynaudsNY	Mean	Std. Deviation	N
Transformed Logarithm Stress DASS 1	.00	.9589	.11566	14
	1.00	1.0809	.12140	59
	Total	1.0575	.12893	73
Transform Inverse Depression DASS 1	.00	.1172	.02238	14
	1.00	.0931	.03136	59
	Total	.0977	.03122	73
Transformed Log Anxiety	.00	.9288	.10037	14
	1.00	1.0303	.12839	59
	Total	1.0109	.12929	73

Box's Test of Equality of Covariance Matrices[a]

Box's M	11.567
F	1.757
df1	6
df2	3199.205
Sig.	.104

a. Design: Intercept + RaynaudsNY

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.993	3391.910[a]	3.000	69.000	.000	.993
	Wilks' Lambda	.007	3391.910[a]	3.000	69.000	.000	.993
	Hotelling's Trace	147.474	3391.910[a]	3.000	69.000	.000	.993
	Roy's Largest Root	147.474	3391.910[a]	3.000	69.000	.000	.993
RaynaudsNY	Pillai's Trace	.160	4.367[a]	3.000	69.000	.007	.160
	Wilks' Lambda	.840	4.367[a]	3.000	69.000	.007	.160
	Hotelling's Trace	.190	4.367[a]	3.000	69.000	.007	.160
	Roy's Largest Root	.190	4.367[a]	3.000	69.000	.007	.160

a. Exact statistic b. Design: Intercept + RaynaudsNY

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Transformed Logarithm Stress DASS 1	.168[a]	1	.168	11.611	.001	.141
	Transform Inverse Depression DASS 1	.007[b]	1	.007	7.393	.008	.094
	Transformed Log Anxiety	.117[c]	1	.117	7.619	.007	.097
Intercept	Transformed Logarithm Stress DASS 1	47.080	1	47.080	3249.470	.000	.979
	Transform Inverse Depression DASS 1	.500	1	.500	559.027	.000	.887
	Transformed Log Anxiety	43.431	1	43.431	2836.854	.000	.976
RaynaudsNY	Transformed Logarithm Stress DASS 1	.168	1	.168	11.611	.001	.141
	Transform Inverse Depression DASS 1	.007	1	.007	7.393	.008	.094
	Transformed Log Anxiety	.117	1	.117	7.619	.007	.097
Error	Transformed Logarithm Stress DASS 1	1.029	71	.014			
	Transform Inverse Depression DASS 1	.064	71	.001			
	Transformed Log Anxiety	1.087	71	.015			
Total	Transformed Logarithm Stress DASS 1	82.832	73				
	Transform Inverse Depression DASS 1	.767	73				
	Transformed Log Anxiety	75.800	73				
Corrected Total	Transformed Logarithm Stress DASS 1	1.197	72				
	Transform Inverse Depression DASS 1	.070	72				
	Transformed Log Anxiety	1.204	72				

a. R Squared = .141 (Adjusted R Squared = .128)

b. R Squared = .094 (Adjusted R Squared = .082)

c. R Squared = .097 (Adjusted R Squared = .084)

RaynaudsNY

Dependent Variable	RaynaudsNY	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Transformed Logarithm Stress DASS 1	.00	.959	.032	.895	1.023
	1.00	1.081	.016	1.050	1.112
Transform Inverse Depression DASS 1	.00	.117	.008	.101	.133
	1.00	.093	.004	.085	.101
Transformed Log Anxiety	.00	.929	.033	.863	.995
	1.00	1.030	.016	.998	1.062

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	61.63	67.20	64.32	1.255	74
Std. Predicted Value	-2.161	2.308	-.003	1.006	74
Standard Error of Predicted Value	4.692	16.890	8.123	2.190	74
Adjusted Predicted Value	52.42	70.19	63.69	2.835	74
Residual	-62.102	61.962	4.977	36.051	74
Std. Residual	-1.710	1.706	.137	.993	74
Stud. Residual	-1.764	1.731	.145	1.021	74
Deleted Residual	-66.105	65.298	5.604	38.154	74
Stud. Deleted Residual	-1.792	1.757	.146	1.027	74
Mahal. Distance	.232	14.801	2.927	2.358	74
Cook's Distance	.000	.098	.016	.019	74
Centered Leverage Value	.003	.203	.040	.032	74

Multiple Regression Analysis: Scleroderma – Hyper-arousal

Hyper-arousal and Psychosocial and Scleroderma Variables - Total Sample

Descriptive Statistics

	Mean	Std. Deviation	N
Hyperarousal	74.0152	15.83617	66
Transformed Reflect Log Age Diag Scleroderma	1.3372	.20475	75
Transformed Sqrt Self Compassion	8.8541	1.00415	62

Correlations		Hyperarousal	Transformed Reflect Log Age Diag Scleroderma	Transformed Sqrt Self Compassion
Pearson Correlation	Hyperarousal	1.000	.368	-.383
	Transformed Reflect Log Age Diag Scleroderma	.368	1.000	-.137
	Transformed Sqrt Self Compassion	-.383	-.137	1.000
Sig. (1-tailed)	Hyperarousal	.	.002	.001
	Transformed Reflect Log Age Diag Scleroderma	.002	.	.150
	Transformed Sqrt Self Compassion	.001	.150	.
N	Hyperarousal	66	63	59
	Transformed Reflect Log Age Diag Scleroderma	63	75	59
	Transformed Sqrt Self Compassion	59	59	62

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Transformed Sqrt Self Compassion, Transformed Reflect Log Age Diag Scleroderma	.	Enter

a. All requested variables entered.

b. Dependent Variable: Hyperarousal

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498[a]	.248	.221	13.97809

a. Predictors: (Constant), Transformed Sqrt Self Compassion, Transformed Reflect Log Age Diag Scleroderma b. Dependent Variable: Hyperarousal

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3603.827	2	1801.914	9.222	.000[a]
	Residual	10941.667	56	195.387		
	Total	14545.494	58			

a. Predictors: (Constant), Transformed Sqrt Self Compassion, Transformed Reflect Log Age Diag Scleroderma b. Dependent Variable: Hyperarousal

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	88.129	21.702		4.061	.000	44.655	131.604					
	Transformed Reflect Log Age Diag Scleroderma	24.830	9.050	.321	2.744	.008	6.701	42.959	.368	.344	.318	.981	1.019
	Transformed Sqrt Self Compassion	-5.344	1.845	-.339	-2.896	.005	-9.041	-1.647	-.383	-.361	-.336	.981	1.019

a. Dependent Variable: Hyperarousal

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Transformed Reflect Log Age Diag Scleroderma	Transformed Sqrt Self Compassion
1	1	2.975	1.000	.00	.00	.00
	2	.020	12.082	.01	.65	.23
	3	.005	25.565	.99	.35	.77

a. Dependent Variable: Hyperarousal

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	56.6793	92.6918	74.2862	7.74018	59
Std. Predicted Value	-2.199	2.369	.034	.982	59
Standard Error of Predicted Value	1.826	5.245	2.976	.927	59
Adjusted Predicted Value	56.4170	92.9142	74.4472	7.81997	56
Residual	-28.24400	31.27230	1.19091	13.96887	56
Std. Residual	-2.021	2.237	.085	.999	56
Stud. Residual	-2.045	2.414	.088	1.026	56
Mahal. Distance	.006	7.183	1.897	1.841	59
Cook's Distance	.000	.318	.019	.046	56
Centered Leverage Value	.000	.124	.033	.032	59

a. Dependent Variable: Hyperarousal

Multiple Regression Analysis: Scleroderma - Reactive Hyper-arousal and Psychosocial and Scleroderma Variables

Descriptive Statistics

	Mean	Std. Deviation	N
Hyperarousal Reactive	7.4058	2.71336	69
SC Overidentification	11.3478	3.41634	69
Total Dismissive RQ!	15.5753	4.27173	73
Raynaud	29.49	26.279	75

Correlations

		Hyperarousal Reactive	SC Overidentification	Total Dismissive RQ!	Raynaud
Pearson Correlation	Hyperarousal Reactive	1.000	.411	.407	.361
	SC Overidentification	.411	1.000	.092	.183
	Total Dismissive RQ!	.407	.092	1.000	.146
	Raynaud	.361	.183	.146	1.000
Sig. (1-tailed)	Hyperarousal Reactive	.	.000	.000	.001
	SC Overidentification	.000	.	.227	.068
	Total Dismissive RQ!	.000	.227	.	.110
	Raynaud	.001	.068	.110	.
N	Hyperarousal Reactive	69	69	68	68
	SC Overidentification	69	69	68	68
	Total Dismissive RQ!	68	68	73	72
	Raynaud	68	68	72	75

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Raynaud, Total Dismissive RQ!, SC Overidentification[b]	.	Enter

a. Dependent Variable: Hyperarousal Reactive

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.605[a]	.366	.336	2.21122

a. Predictors: (Constant), Raynaud, Total Dismissive RQ!, SC Overidentification

b. Dependent Variable: Hyperarousal Reactive

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	180.348	3	60.116	12.295	.000[b]
	Residual	312.927	64	4.889		
	Total	493.275	67			

a. Dependent Variable: Hyperarousal Reactive b. Predictors Raynaud, Total Dismissive Overidentification

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statist	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.275	1.303		.211	.833	-2.328	2.879					
	SC Overidentification	.265	.081	.334	3.293	.002	.104	.427	.411	.381	.328	.962	
	Total Dismissive RQ!	.215	.064	.339	3.363	.001	.087	.343	.407	.388	.335	.974	
	Raynaud	.026	.011	.250	2.447	.017	.005	.047	.361	.293	.244	.950	

a. Dependent Variable: Hyperarousal Reactive

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	SC Overidentification	Total Dismissive RQ!	Raynaud
1	1	3.562	1.000	.00	.01	.00	.02
	2	.342	3.229	.01	.01	.01	.97
	3	.069	7.191	.00	.64	.43	.00
	4	.028	11.299	.98	.34	.55	.00

a. Dependent Variable: Hyperarousal Reactive

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.4240	12.0477	7.4469	1.61052	67
Std. Predicted Value	-1.817	2.829	.025	.982	67
Standard Error of Predicted Value	.291	.874	.517	.135	67
Adjusted Predicted Value	4.3398	11.7013	7.4522	1.59442	67
Residual	-5.34198	5.19745	-.05888	2.10916	67
Std. Residual	-2.416	2.350	-.027	.954	67
Stud. Residual	-2.474	2.402	-.028	.984	67
Deleted Residual	-5.60181	5.42703	-.06413	2.24696	67
Stud. Deleted Residual	-2.581	2.498	-.028	.997	67
Mahal. Distance	.177	9.471	2.927	2.123	67
Cook's Distance	.000	.158	.016	.028	67
Centered Leverage Value	.003	.141	.044	.032	67

a. Dependent Variable: Hyperarousal Reactive

Appendix C

Statistical Analysis Study 2

Frequencies: Scleroderma, Community and Psychosocial Variables

Demographic Information

Statistics

		Age	Country	Gender	Education
N	Valid	72	75	75	75
	Missing	3	0	0	0
Mean		47.69			
Minimum		18			
Maximum		76			

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	1.3	1.3	1.3
	1	54	72.0	72.0	73.3
	2	19	25.3	25.3	98.7
	Gender	1	1.3	1.3	100.0
	Total	75	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	4.0	4.0	4.0
	1	3	4.0	4.0	8.0
	2	34	45.3	45.3	53.3
	3	26	34.7	34.7	88.0
	4	7	9.3	9.3	97.3
	8	1	1.3	1.3	98.7
	Education	1	1.3	1.3	100.0
	Total	75	100.0	100.0	

Reliability Statistics

Scleroderma, Community and Psychosocial Variables

Stress DASS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.818	.824	7

Anxiety

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.722	.738	7

Depression

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.911	.912	7

Dismissive Attachment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.996	.996	5

Fearful Attachment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.996	.996	4

EMWS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.982	.982	21

Re-appraisal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.875	.878	6

Suppression

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.739	.735	4

Reactive Hyperarousal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.619	.621	3

Item Statistics

	Mean	Std. Deviation	N
HYP6	2.59	1.340	139
HYP12	2.66	1.183	139
HYP17	1.84	1.118	139

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.353	.332	.365	.033	1.099	.000	3

Hyper-arousal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.854	.853	26

Self-Compassion

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.779	.780	26

Self-Judgment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.838	.838	5

Isolation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.813	4

Over-identification

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.783	.783	4

Self Kindness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.897	.898	5

Common Humanity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.806	.805	4

Mindfulness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.805	.811	4

T-Tests and MANOVA- Scleroderma and Community Groups

Psychosocial Variables – Scleroderma and No Scleroderma Groups

Group Statistics

	ScleroNoYes	N	Mean	Std. Deviation	Std. Error Mean
Total EMWS	No Scleroderma	62	78.6452	20.21531	2.56735
	Yes Scleroderma	88	70.0284	23.94298	2.55233
ERQ Reappraisal	No Scleroderma	58	30.3103	6.07615	.79784
	Yes Scleroderma	81	27.9630	7.99131	.88792
Hyperarousal	No Scleroderma	57	71.4211	13.81891	1.83036
	Yes Scleroderma	78	73.6410	15.92513	1.80317
Self Compassion Self Kindness	No Scleroderma	58	15.8103	4.45821	.58539
	Yes Scleroderma	81	13.6049	4.80021	.53336
Self Compassion Mindfulness	No Scleroderma	58	13.9483	2.95238	.38767
	Yes Scleroderma	81	12.8025	3.36311	.37368

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total EMWS	Equal variances assumed	3.300	.071	2.312	148	.022	8.61675	3.72765	1.25046	15.98305
	Equal variances not assumed			2.380	143.132	.019	8.61675	3.62017	1.46084	15.77267
ERQ Reappraisal	Equal variances assumed	2.070	.153	1.881	137	.062	2.34738	1.24812	-.12070	4.81546
	Equal variances not assumed			1.966	136.472	.051	2.34738	1.19371	-.01319	4.70795
Hyperarousal	Equal variances assumed	1.175	.280	-.845	133	.400	-2.21997	2.62674	-7.41556	2.97561
	Equal variances not assumed			-.864	129.045	.389	-2.21997	2.56936	-7.30350	2.86356
Self Compassion Self Kindness	Equal variances assumed	.389	.534	2.751	137	.007	2.20541	.80173	.62005	3.79077
	Equal variances not assumed			2.785	128.045	.006	2.20541	.79193	.63844	3.77237
Self Compassion Mindfulness	Equal variances assumed	1.105	.295	2.083	137	.039	1.14581	.55019	.05784	2.23378
	Equal variances not assumed			2.128	131.341	.035	1.14581	.53844	.08066	2.21095

MANOVA: Scleroderma/No Scleroderma Groups

Between-Subjects Factors

		N
SclerodNoYs	1.00	57
	2.00	78

Descriptive Statistics

	SclerodNoYs	Mean	Std. Deviation	N
Self Compassion Self Kindness	1.00	15.6491	4.32390	57
	2.00	13.6410	4.80253	78
	Total	14.4889	4.69656	135
Self Compassion Mindfulness	1.00	13.8421	2.86475	57
	2.00	12.7436	3.34756	78
	Total	13.2074	3.18836	135
Total EMWS	1.00	77.7368	20.23745	57
	2.00	69.6731	23.90292	78
	Total	73.0778	22.70355	135

Box's Test of Equality of Covariance Matrices[a]

Box's M	6.570
F	1.067
df1	6
df2	100229.431
Sig.	.380

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + SclerodNoYs

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.959	1030.406[a]	3.000	131.000	.000	.959
	Wilks' Lambda	.041	1030.406[a]	3.000	131.000	.000	.959
	Hotelling's Trace	23.597	1030.406[a]	3.000	131.000	.000	.959
	Roy's Largest Root	23.597	1030.406[a]	3.000	131.000	.000	.959
SclerodNoYs	Pillai's Trace	.060	2.802[a]	3.000	131.000	.042	.060
	Wilks' Lambda	.940	2.802[a]	3.000	131.000	.042	.060
	Hotelling's Trace	.064	2.802[a]	3.000	131.000	.042	.060
	Roy's Largest Root	.064	2.802[a]	3.000	131.000	.042	.060

a. Exact statistic b. Design: Intercept + SclerodNoYs

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Self Compassion Self Kindness	.654	1	133	.420
Self Compassion Mindfulness	1.407	1	133	.238
Total EMWS	3.054	1	133	.083

Tests the null hypothesis that the error variance of the dependent variable is equal across groups. a. Design: Intercept + SclerodNoYs

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Self Compassion Self Kindness	132.802[a]	1	132.802	6.257	.014	.045
	Self Compassion Mindfulness	39.742[b]	1	39.742	3.997	.048	.029
	Total EMWS	2141.467[c]	1	2141.467	4.255	.041	.031
Intercept	Self Compassion Self Kindness	28253.928	1	28253.928	1331.160	.000	.909
	Self Compassion Mindfulness	23277.253	1	23277.253	2341.013	.000	.946
	Total EMWS	715630.934	1	715630.934	1422.089	.000	.914
SclerodNoYs	Self Compassion Self Kindness	132.802	1	132.802	6.257	.014	.045
	Self Compassion Mindfulness	39.742	1	39.742	3.997	.048	.029
	Total EMWS	2141.467	1	2141.467	4.255	.041	.031
Error	Self Compassion Self Kindness	2822.931	133	21.225			
	Self Compassion Mindfulness	1322.451	133	9.943			
	Total EMWS	66928.966	133	503.225			
Total	Self Compassion Self Kindness	31296.000	135				
	Self Compassion Mindfulness	24911.000	135				
	Total EMWS	790019.250	135				
Corrected Total	Self Compassion Self Kindness	2955.733	134				
	Self Compassion Mindfulness	1362.193	134				
	Total EMWS	69070.433	134				

SclerodNoYs

Dependent Variable	SclerodNoYs	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Self Compassion Self Kindness	dimension1 1.00	15.649	.610	14.442	16.856
	2.00	13.641	.522	12.609	14.673
Self Compassion Mindfulness	dimension1 1.00	13.842	.418	13.016	14.668
	2.00	12.744	.357	12.037	13.450
Total EMWS	dimension1 1.00	77.737	2.971	71.860	83.614
	2.00	69.673	2.540	64.649	74.697

Mann Witney U-Test – Scleroderma and No Scleroderma Groups

(Psychosocial (skewed) Variables: Over-identification – Anxiety – Depression)

Over-identification– Scleroderma and No Scleroderma Groups

Mann-Whitney Test

Ranks

	ScleroNoYes	N	Mean Rank	Sum of Ranks
Self Compassion Over Identification	No Scleroderma	58	56.09	3253.50
	Yes Scleroderma	80	79.22	6337.50
	Total	138		

Test Statistics[a]

	Self Compassion Over Identification
Mann-Whitney U	1542.500
Wilcoxon W	3253.500
Z	-3.367
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: ScleroNoYes

Report

Self Compassion Over Identification

ScleroNoYes	N	Median
No Scleroderma	58	13.0000
Yes Scleroderma	80	16.0000
Total	138	15.0000

Mann Witney U-Test – Scleroderma and No Scleroderma Groups

Depression, Anxiety and Stress – Scleroderma and No Scleroderma Groups

Ranks

	ScleroNoYes	N	Mean Rank	Sum of Ranks
Anxiety DASS	No Scleroderma	63	58.53	3687.50
	Yes Scleroderma	93	92.03	8558.50
	Total	156		

Test Statistics[a]

	Anxiety DASS
Mann-Whitney U	1671.500
Wilcoxon W	3687.500
Z	-4.604
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: ScleroNoYes

Ranks	ScleroNoYes	N	Mean Rank	Sum of Ranks
Depression DASS	No Scleroderma	63	65.41	4121.00
	Yes Scleroderma	92	86.62	7969.00
	Total	155		

Test Statistics[a]	Depression DASS
Mann-Whitney U	2105.000
Wilcoxon W	4121.000
Z	-2.921
Asymp. Sig. (2-tailed)	.003

a. Grouping Variable: ScleroNoYes

Medium Anxiety Depression

ScleroNoYes		Anxiety DASS	Depression DASS
No Scleroderma	N	63	63
	Median	8.0000	8.0000
Yes Scleroderma	N	93	92
	Median	10.0000	10.0000
Total	N	156	155
	Median	9.0000	9.0000

Frequencies: Diffuse and Limited Sclerosis and Community Groups - Depression Anxiety and Stress

No Sclero Dif Lim			Stress DASS	Anxiety DASS	Depression DASS
No Sclero	N	Valid	63	63	63
		Missing	0	0	0
	Mean		11.4603	8.5397	9.4921
	Range		13.00	6.00	10.00
	Minimum		7.00	7.00	7.00
	Maximum		20.00	13.00	17.00
Diffuse Sclero	N	Valid	34	34	33
		Missing	1	1	2
	Mean		11.7353	11.3235	11.6364
	Range		13.00	12.00	18.00
	Minimum		7.00	7.00	7.00
	Maximum		20.00	19.00	25.00
Limited Sclero	N	Valid	49	50	50
		Missing	2	1	1
	Mean		12.4082	10.9400	11.7000
	Range		14.00	15.00	20.00
	Minimum		7.00	7.00	7.00
	Maximum		21.00	22.00	27.00

Frequencies: Stress – DASS

No Sclero Dif Lim			Frequency	Percent	Valid Percent	Cumulative Percent
No Sclero	Valid	7.00	6	9.5	9.5	9.5
		8.00	5	7.9	7.9	17.5
		9.00	5	7.9	7.9	25.4
		10.00	5	7.9	7.9	33.3
		11.00	9	14.3	14.3	47.6
		12.00	13	20.6	20.6	68.3
		13.00	7	11.1	11.1	79.4
		14.00	7	11.1	11.1	90.5
		15.00	2	3.2	3.2	93.7
		16.00	1	1.6	1.6	95.2
		17.00	1	1.6	1.6	96.8
		18.00	1	1.6	1.6	98.4
		20.00	1	1.6	1.6	100.0
		Total	63	100.0	100.0	
Diffuse Sclero	Valid	7.00	4	11.4	11.8	11.8
		8.00	2	5.7	5.9	17.6
		9.00	4	11.4	11.8	29.4
		10.00	2	5.7	5.9	35.3
		11.00	6	17.1	17.6	52.9
		12.00	5	14.3	14.7	67.6
		13.00	2	5.7	5.9	73.5
		14.00	2	5.7	5.9	79.4
		15.00	1	2.9	2.9	82.4
		16.00	3	8.6	8.8	91.2
		17.00	1	2.9	2.9	94.1
		19.00	1	2.9	2.9	97.1
		20.00	1	2.9	2.9	100.0
		Total	34	97.1	100.0	
	Missing	System	1	2.9		
	Total		35	100.0		
Limited Sclero	Valid	7.00	2	3.9	4.1	4.1
		8.00	4	7.8	8.2	12.2
		9.00	6	11.8	12.2	24.5
		10.00	8	15.7	16.3	40.8
		11.00	4	7.8	8.2	49.0
		12.00	4	7.8	8.2	57.1
		13.00	5	9.8	10.2	67.3
		14.00	4	7.8	8.2	75.5

		15.00	2	3.9	4.1	79.6
		16.00	3	5.9	6.1	85.7
		18.00	1	2.0	2.0	87.8
		19.00	3	5.9	6.1	93.9
		20.00	1	2.0	2.0	95.9
		21.00	2	3.9	4.1	100.0
		Total	49	96.1	100.0	
	Missing	System	2	3.9		
	Total		51	100.0		

Anxiety DASS

No Sclero Dif Lim			Frequency	Percent	Valid Percent	Cumulative Percent
No Sclero	Valid	7.00	23	36.5	36.5	36.5
		8.00	13	20.6	20.6	57.1
		9.00	9	14.3	14.3	71.4
		10.00	10	15.9	15.9	87.3
		11.00	5	7.9	7.9	95.2
		12.00	2	3.2	3.2	98.4
		13.00	1	1.6	1.6	100.0
		Total	63	100.0	100.0	
Diffuse Sclero	Valid	7.00	4	11.4	11.8	11.8
		8.00	4	11.4	11.8	23.5
		9.00	4	11.4	11.8	35.3
		10.00	5	14.3	14.7	50.0
		11.00	1	2.9	2.9	52.9
		12.00	5	14.3	14.7	67.6
		13.00	3	8.6	8.8	76.5
		14.00	3	8.6	8.8	85.3
		16.00	2	5.7	5.9	91.2
		17.00	1	2.9	2.9	94.1
		19.00	2	5.7	5.9	100.0
		Total	34	97.1	100.0	
	Missing	System	1	2.9		
	Total		35	100.0		
Limited Sclero	Valid	7.00	11	21.6	22.0	22.0
		8.00	5	9.8	10.0	32.0
		9.00	6	11.8	12.0	44.0
		10.00	6	11.8	12.0	56.0
		11.00	3	5.9	6.0	62.0
		12.00	3	5.9	6.0	68.0
		13.00	5	9.8	10.0	78.0
		14.00	2	3.9	4.0	82.0
		15.00	4	7.8	8.0	90.0
		17.00	1	2.0	2.0	92.0
		18.00	2	3.9	4.0	96.0
		19.00	1	2.0	2.0	98.0
		22.00	1	2.0	2.0	100.0
		Total	50	98.0	100.0	
	Missing	System	1	2.0		
	Total		51	100.0		

Depression DASS

No Sclero Dif Lim			Frequency	Percent	Valid Percent	Cumulative Percent
No Sclero	Valid	7.00	17	27.0	27.0	27.0
		8.00	15	23.8	23.8	50.8
		9.00	7	11.1	11.1	61.9
		10.00	5	7.9	7.9	69.8
		11.00	5	7.9	7.9	77.8
		12.00	4	6.3	6.3	84.1
		13.00	4	6.3	6.3	90.5
		14.00	3	4.8	4.8	95.2
		16.00	2	3.2	3.2	98.4
		17.00	1	1.6	1.6	100.0
		Total	63	100.0	100.0	
Diffuse Sclero	Valid	7.00	5	14.3	15.2	15.2
		8.00	9	25.7	27.3	42.4
		9.00	1	2.9	3.0	45.5
		10.00	3	8.6	9.1	54.5
		11.00	3	8.6	9.1	63.6
		12.00	1	2.9	3.0	66.7
		13.00	2	5.7	6.1	72.7
		14.00	2	5.7	6.1	78.8
		15.00	1	2.9	3.0	81.8
		16.00	1	2.9	3.0	84.8
		17.00	1	2.9	3.0	87.9
		21.00	2	5.7	6.1	93.9
		24.00	1	2.9	3.0	97.0
		25.00	1	2.9	3.0	100.0
		Total	33	94.3	100.0	
	Missing	System	2	5.7		
	Total		35	100.0		
Limited Sclero	Valid	7.00	4	7.8	8.0	8.0
		8.00	10	19.6	20.0	28.0
		9.00	6	11.8	12.0	40.0
		10.00	5	9.8	10.0	50.0
		11.00	5	9.8	10.0	60.0
		12.00	6	11.8	12.0	72.0
		13.00	5	9.8	10.0	82.0
		14.00	1	2.0	2.0	84.0
		15.00	1	2.0	2.0	86.0

		16.00	1	2.0	2.0	88.0
		17.00	1	2.0	2.0	90.0
		18.00	1	2.0	2.0	92.0
		24.00	2	3.9	4.0	96.0
		26.00	1	2.0	2.0	98.0
		27.00	1	2.0	2.0	100.0
		Total	50	98.0	100.0	
	Missing	System	1	2.0		
	Total		51	100.0		

Kruskal-Wallis Test: No Scleroderma/Diffuse/Limited

Depression, Anxiety and Stress

Ranks

	No Sclero Dif Lim	N	Mean Rank
Stress DASS dimension1	No Sclero	63	71.02
	Diffuse Sclero	34	71.69
	Limited Sclero	49	77.95
	Total	146	
Anxiety DASS dimension1	No Sclero	63	55.56
	Diffuse Sclero	34	92.82
	Limited Sclero	50	84.44
	Total	147	
Depression DASS dimension1	No Sclero	63	61.89
	Diffuse Sclero	33	78.95
	Limited Sclero	50	84.53
	Total	146	

Test Statistics[a,b]

	Stress DASS	Anxiety DASS	Depression DASS
Chi-square	.831	22.057	8.890
df	2	2	2
Asymp. Sig.	.660	.000	.012

a. Kruskal Wallis Test b. Grouping Variable: No Sclero Dif Lim

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Stress DASS * No Sclero Dif Lim	146	67.6%	70	32.4%	216	100.0%
Anxiety DASS * No Sclero Dif Lim	147	68.1%	69	31.9%	216	100.0%
Depression DASS * No Sclero Dif Lim	146	67.6%	70	32.4%	216	100.0%

Report

No Sclero Dif Lim		Stress DASS	Anxiety DASS	Depression DASS
No Sclero	N	63	63	63
	Median	12.0000	8.0000	8.0000
Diffuse Sclero	N	34	34	33
	Median	11.0000	10.5000	10.0000
Limited Sclero	N	49	50	50
	Median	12.0000	10.0000	10.5000
Total	N	146	147	146
	Median	12.0000	9.0000	9.0000

Kruskal Wallis: No Scleroderma/Diffuse/Limited

Psychosocial variables (skewed)

Ranks

	No Sclero Dif Lim	N	Mean Rank
Hyperarousal Reactive dimension1	No Sclero	58	60.59
	Diffuse Sclero	31	81.48
	Limited Sclero	43	63.66
	Total	132	
Self Compassion Over Identification dimension1	No Sclero	58	53.31
	Diffuse Sclero	31	79.39
	Limited Sclero	42	73.64
	Total	131	

Test Statistics[a,b]

	Hyperarousal Reactive	Self Compassion Over Identification
Chi-square	6.464	12.137
df	2	2
Asymp. Sig.	.039	.002

a. Kruskal Wallis Test

a. Grouping Variable: No Sclero Dif Lim

No Sclero Dif Lim		Hyperarousal Reactive	Self Compassion Over Identification
No Sclero	N	58	58
	Median	6.0000	13.0000
Diffuse Sclero	N	31	31
	Median	8.0000	16.0000
Limited Sclero	N	43	42
	Median	6.0000	15.5000
Total	N	132	131
	Median	7.0000	15.0000

T-Tests Community Diffuse groups

Group Statistics

	No Sclero Dif Lim	N	Mean	Std. Deviation	Std. Error Mean
Total EMWS	No Sclero	62	78.6452	20.21531	2.56735
	Diffuse Sclero	32	66.7656	27.23701	4.81487
ERQ Reappraisal	No Sclero	58	30.3103	6.07615	.79784
	Diffuse Sclero	31	28.7742	8.76246	1.57378
Hyperarousal	No Sclero	57	71.4211	13.81891	1.83036
	Diffuse Sclero	30	75.8667	15.87176	2.89777
Self Compassion Self Kindness	No Sclero	58	15.8103	4.45821	.58539
	Diffuse Sclero	31	15.3548	5.59493	1.00488
Self Compassion Mindfulness	No Sclero	58	13.9483	2.95238	.38767
	Diffuse Sclero	31	14.2903	3.50422	.62938

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total EMWS	Equal variances assumed	8.476	.005	2.391	92	.019	11.87954	4.96802	2.01262	21.74645
	Equal variances not assumed			2.177	49.116	.034	11.87954	5.45658	.91479	22.84428
ERQ Reappraisal	Equal variances assumed	3.543	.063	.970	87	.335	1.53615	1.58363	-1.61148	4.68378
	Equal variances not assumed			.871	45.809	.389	1.53615	1.76447	-2.01593	5.08824
Hyperarousal	Equal variances assumed	1.471	.229	-1.354	85	.179	-4.44561	3.28232	-10.97174	2.08051
	Equal variances not assumed			-1.297	52.434	.200	-4.44561	3.42743	-11.32191	2.43068
Self Compassion Self Kindness	Equal variances assumed	3.590	.061	.420	87	.676	.45551	1.08577	-1.70257	2.61358
	Equal variances not assumed			.392	50.741	.697	.45551	1.16296	-1.87951	2.79053
Self Compassion Mindfulness	Equal variances assumed	3.975	.049	-.488	87	.627	-.34205	.70163	-1.73661	1.05251
	Equal variances not assumed			-.463	53.062	.645	-.34205	.73919	-1.82463	1.14054

T-Tests Community Limited groups

Group Statistics

	No Sclero Dif Lim	N	Mean	Std. Deviation	Std. Error Mean
Total EMWS	No Sclero	62	78.6452	20.21531	2.56735
	Limited Sclero	47	72.7234	21.73827	3.17085
ERQ Reappraisal	No Sclero	58	30.3103	6.07615	.79784
	Limited Sclero	43	27.5581	7.25489	1.10636
Hyperarousal	No Sclero	57	71.4211	13.81891	1.83036
	Limited Sclero	41	72.0244	15.62128	2.43963
Self Compassion Self Kindness	No Sclero	58	15.8103	4.45821	.58539
	Limited Sclero	43	12.4186	3.97152	.60565
Self Compassion Mindfulness	No Sclero	58	13.9483	2.95238	.38767
	Limited Sclero	43	12.0000	3.08607	.47062

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total EMWS	Equal variances assumed	.376	.541	1.466	107	.146	5.92176	4.03901	-2.08511	13.92862
	Equal variances not assumed			1.451	95.221	.150	5.92176	4.07990	-2.17762	14.02114
ERQ Reappraisal	Equal variances assumed	.240	.625	2.072	99	.041	2.75221	1.32858	.11602	5.38839
	Equal variances not assumed			2.018	80.917	.047	2.75221	1.36403	.03817	5.46624
Hyperarousal	Equal variances assumed	.054	.816	-.202	96	.840	-.60334	2.98914	-6.53674	5.33006
	Equal variances not assumed			-.198	79.673	.844	-.60334	3.04992	-6.67326	5.46659
Self Compassion Self Kindness	Equal variances assumed	.919	.340	3.958	99	.000	3.39174	.85698	1.69130	5.09218
	Equal variances not assumed			4.027	95.631	.000	3.39174	.84232	1.71967	5.06381
Self Compassion Mindfulness	Equal variances assumed	.396	.531	3.217	99	.002	1.94828	.60569	.74645	3.15010
	Equal variances not assumed			3.195	88.359	.002	1.94828	.60973	.73664	3.15992

MANOVA : No Scleroderma/Diffuse/Limited

Psychosocial variables

MANOVA Removal of EMWS (significant Levine's)

Between-Subjects Factors

		Value Label	N
No Sclero Dif Lim	1	No Sclero	58
	2	Diffuse Sclero	31
	3	Limited Sclero	43

Descriptive Statistics

	No Sclero Dif Lim		Mean	Std. Deviation	N
Self Compassion Self Kindness	dimension1	No Sclero	15.8103	4.45821	58
		Diffuse Sclero	15.3548	5.59493	31
		Limited Sclero	12.4186	3.97152	43
		Total	14.5985	4.81863	132
Self Compassion Mindfulness	dimension1	No Sclero	13.9483	2.95238	58
		Diffuse Sclero	14.2903	3.50422	31
		Limited Sclero	12.0000	3.08607	43
		Total	13.3939	3.25918	132
ERQ Reappraisal	dimension1	No Sclero	30.3103	6.07615	58
		Diffuse Sclero	28.7742	8.76246	31
		Limited Sclero	27.5581	7.25489	43
		Total	29.0530	7.20932	132

Box's Test of Equality of Covariance Matrices[a]

Box's M	20.762
F	1.667
df1	12
df2	48238.089
Sig.	.067

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + ScleroNoDL

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.958	975.065[a]	3.000	127.000	.000	.958
	Wilks' Lambda	.042	975.065[a]	3.000	127.000	.000	.958
	Hotelling's Trace	23.033	975.065[a]	3.000	127.000	.000	.958
	Roy's Largest Root	23.033	975.065[a]	3.000	127.000	.000	.958
ScleroNoDL	Pillai's Trace	.132	3.004	6.000	256.000	.007	.066
	Wilks' Lambda	.871	3.026[a]	6.000	254.000	.007	.067
	Hotelling's Trace	.145	3.048	6.000	252.000	.007	.068
	Roy's Largest Root	.121	5.153[b]	3.000	128.000	.002	.108

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept + ScleroNoDL

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Self Compassion Self Kindness	3.612	2	129	.030
Self Compassion Mindfulness	2.012	2	129	.138
ERQ Reappraisal	1.656	2	129	.195

Tests the null hypothesis that the error variance of the dependent variable is equal across groups. a. Design: Intercept + ScleroNoDL

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Self Compassion Self Kindness	307.244[a]	2	153.622	7.247	.001	.101
	Self Compassion Mindfulness	126.283[b]	2	63.142	6.438	.002	.091
	ERQ Reappraisal	190.191[c]	2	95.095	1.854	.161	.028
Intercept	Self Compassion Self Kindness	26108.719	1	26108.719	1231.689	.000	.905
	Self Compassion Mindfulness	22254.678	1	22254.678	2269.033	.000	.946
	ERQ Reappraisal	103180.909	1	103180.909	2011.100	.000	.940
ScleroNoDL	Self Compassion Self Kindness	307.244	2	153.622	7.247	.001	.101
	Self Compassion Mindfulness	126.283	2	63.142	6.438	.002	.091
	ERQ Reappraisal	190.191	2	95.095	1.854	.161	.028
Error	Self Compassion Self Kindness	2734.476	129	21.197			
	Self Compassion Mindfulness	1265.232	129	9.808			
	ERQ Reappraisal	6618.438	129	51.306			
Total	Self Compassion Self Kindness	31173.000	132				
	Self Compassion Mindfulness	25072.000	132				
	ERQ Reappraisal	118227.000	132				
Corrected Total	Self Compassion Self Kindness	3041.720	131				
	Self Compassion Mindfulness	1391.515	131				
	ERQ Reappraisal	6808.629	131				

a. R Squared = .101 (Adjusted R Squared = .087)

b. R Squared = .091 (Adjusted R Squared = .077)

c. R Squared = .028 (Adjusted R Squared = .013)

No Sclero Dif Lim

Dependent Variable	No Sclero Dif Lim		Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Self Compassion Self Kindness	dimension1	No Sclero	15.810	.605	14.614	17.006
		Diffuse Sclero	15.355	.827	13.719	16.991
		Limited Sclero	12.419	.702	11.029	13.808
Self Compassion Mindfulness	dimension1	No Sclero	13.948	.411	13.135	14.762
		Diffuse Sclero	14.290	.562	13.177	15.403
		Limited Sclero	12.000	.478	11.055	12.945
ERQ Reappraisal	dimension1	No Sclero	30.310	.941	28.449	32.171
		Diffuse Sclero	28.774	1.286	26.229	31.320
		Limited Sclero	27.558	1.092	25.397	29.719

Appendix D

Statistical Analysis Study 3

Frequencies: Scleroderma, Breast Cancer, Community and Psychosocial Variables

Demographic and Health Information

Frequencies Breast Cancer

Statistics

		AgeCurrent	AgeDBC
N	Valid	23	23
	Missing	7	7
Mean		53.57	50.35
Minimum		37	36
Maximum		76	69

Country

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	6.5	6.5	6.5
	1	23	74.2	74.2	80.6
	2	1	3.2	3.2	83.9
	3	1	3.2	3.2	87.1
	4	2	6.5	6.5	93.5
	5	1	3.2	3.2	96.8
	6	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	6.5	6.5	6.5
	1	28	90.3	90.3	96.8
	2	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	6.5	6.5	6.5
	1	1	3.2	3.2	9.7
	2	7	22.6	22.6	32.3
	3	16	51.6	51.6	83.9
	4	5	16.1	16.1	100.0
	Total	31	100.0	100.0	

TypeBC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	9.7	9.7	9.7
	1. DCIS	1	3.2	3.2	12.9
	3	3	9.7	9.7	22.6
	3 Early Breast Cancer	1	3.2	3.2	25.8
	benign	1	3.2	3.2	29.0
	Bi-lateral mastectomy for stage 3 BC at 60; currently diagnosed with bony metasteses left rib	1	3.2	3.2	32.3
	DCIS	1	3.2	3.2	35.5
	DCIS with possible microinvasion, but no lymph node involvement - large tumour 55 mm	1	3.2	3.2	38.7
	DCIS, Stage IIB and III, Category 1	1	3.2	3.2	41.9
	dddd	1	3.2	3.2	45.2
	early breast cancer	2	6.5	6.5	51.6
	Early breast cancer	1	3.2	3.2	54.8
	early breast cancer stage 2 category 1	1	3.2	3.2	58.1
	Early breast cancer, stage 1, 0 lymph nodes affected	1	3.2	3.2	61.3
	fgdfgdg	1	3.2	3.2	64.5
	invasive ductal carcinoma	1	3.2	3.2	67.7
	Invasive Ductal Carcinoma	1	3.2	3.2	71.0
	NA	1	3.2	3.2	74.2
	Open-Ended Response	1	3.2	3.2	77.4

	Please state what type of breast cancer you have	1	3.2	3.2	80.6
	Stage 0	1	3.2	3.2	83.9
	Stage 1	1	3.2	3.2	87.1
	Stage 11 mixed invasive lobular and ductal	1	3.2	3.2	90.3
	Stage II - Category 2: 6 lymph nodes surgically removed	1	3.2	3.2	93.5
	stage IV, catergory 3 inflammatory breast cancer	1	3.2	3.2	96.8
	Type 3 - Stage IIB and category 3	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Diagnosed with Scleroderma or Breast Cancer

ScleroBCancer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	2.0	2.0	2.0
	Scleroderma	122	79.7	79.7	81.7
	Breast Cancer	28	18.3	18.3	100.0
	Total	153	100.0	100.0	

Reliability Statistics

Scleroderma, Breast Cancer, Community and Psychosocial Variables

Anxiety

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.704	.720	7

Depression DASS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.915	.916	7

Stress DASS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.819	.824	7

Dismissive Attachment RQ

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.996	.996	5

Fearful Attachment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.996	.996	4

EMWS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.984	.984	21

Self-kindness SCS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.889	.890	5

Mindfulness SCS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.797	.802	4

Overidentification SCS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.796	.796	4

Self-Compassion Scale

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.798	.799	26

Hyper-arousal

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.855	.853	26

Suppression ERQ

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.753	.749	4

Study 3(a) Multiple Regression Analysis – Differences in Predictor Variables

Breast Cancer and Scleroderma - Pain and Psychosocial Variables

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed SQRT Pain	4.6072	3.00576	115
Total EMWS	70.4045	24.49157	110
RQ Insecure Dismissive	15.3761	4.20271	109

Correlations

		Transformed SQRT Pain	Total EMWS	RQ Insecure Dismissive
Pearson Correlation	Transformed SQRT Pain	1.000	-.249	.228
	Total EMWS	-.249	1.000	-.149
	RQ Insecure Dismissive	.228	-.149	1.000
Sig. (1-tailed)	Transformed SQRT Pain	.	.005	.009
	Total EMWS	.005	.	.063
	RQ Insecure Dismissive	.009	.063	.
N	Transformed SQRT Pain	115	109	108
	Total EMWS	109	110	107
	RQ Insecure Dismissive	108	107	109

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RQ Insecure Dismissive, Total EMWS[b]	.	Enter

a. Dependent Variable: Transformed SQRT Pain

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.315[a]	.099	.082	2.88024

a. Predictors: (Constant), RQ Insecure Dismissive, Total EMWS

b. Dependent Variable: Transformed SQRT Pain

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	94.910	2	47.455	5.720	.004[b]
	Residual	862.759	104	8.296		
	Total	957.670	106			

a. Dependent Variable: Transformed SQRT Pain

b. Predictors: (Constant), RQ Insecure Dismissive, Total EMWS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Sta	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	
1	(Constant)	4.362	1.436		3.039	.003	1.516	7.209					
	Total EMWS	-.027	.012	-.220	-2.336	.021	-.050	-.004	-.249	-.223	-.217	.978	
	RQ Insecure Dismissive	.139	.067	.195	2.072	.041	.006	.273	.228	.199	.193	.978	

a. Dependent Variable: Transformed SQRT Pain

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Total EMWS	RQ Insecure Dismissive
1	1	2.873	1.000	.00	.01	.01
	2	.103	5.290	.01	.59	.27
	3	.024	10.838	.99	.40	.73

a. Dependent Variable: Transformed SQRT Pain

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.8926	7.1158	4.5979	.94583	107
Std. Predicted Value	-1.812	2.651	-.010	1.000	107
Standard Error of Predicted Value	.280	.895	.466	.127	107
Adjusted Predicted Value	2.8438	6.9887	4.6016	.94707	106
Residual	-6.01837	6.43710	-.03744	2.84197	106
Std. Residual	-2.090	2.235	-.013	.987	106
Stud. Residual	-2.122	2.264	-.013	1.001	106
Deleted Residual	-6.20666	6.60366	-.03849	2.92450	106
Stud. Deleted Residual	-2.159	2.310	-.014	1.007	106
Mahal. Distance	.011	9.256	1.983	1.674	107
Cook's Distance	.000	.084	.010	.014	106
Centered Leverage Value	.000	.087	.019	.016	107

a. Dependent Variable: Transformed SQRT Pain

Multiple Regression Analysis: Breast Cancer - Pain

Descriptive Statistics

BreastCancerScleroderma		Mean	Std. Deviation	N
BreastCancer	Transformed SQRT Pain	3.4926	3.65834	23
	Total EMWS	71.9091	27.12038	22
	RQ Insecure Dismissive	15.2727	4.10785	22
Scleroderma	Transformed SQRT Pain	4.8859	2.77309	92
	Total EMWS	70.0284	23.94298	88
	RQ Insecure Dismissive	15.4023	4.24938	87

Correlations

BreastCancerScleroderma			Transformed SQRT Pain	Total EMWS	RQ Insecure Dismissive
BreastCancer	Pearson Correlation	Transformed SQRT Pain	1.000	-.005	.032
		Total EMWS	-.005	1.000	-.025
		RQ Insecure Dismissive	.032	-.025	1.000
	Sig. (1-tailed)	Transformed SQRT Pain	.	.491	.444
		Total EMWS	.491	.	.457
		RQ Insecure Dismissive	.444	.457	.
	N	Transformed SQRT Pain	23	22	22
		Total EMWS	22	22	22
		RQ Insecure Dismissive	22	22	22
Scleroderma	Pearson Correlation	Transformed SQRT Pain	1.000	-.335	.294
		Total EMWS	-.335	1.000	-.183
		RQ Insecure Dismissive	.294	-.183	1.000
	Sig. (1-tailed)	Transformed SQRT Pain	.	.001	.003
		Total EMWS	.001	.	.047
		RQ Insecure Dismissive	.003	.047	.
	N	Transformed SQRT Pain	92	87	86
		Total EMWS	87	88	85
		RQ Insecure Dismissive	86	85	87

Variables Entered/Removed[a]

Scleroderma	Model	Variables Entered	Variables Removed	Method
.	1	RQ Insecure Dismissive, Total EMWS[b]	.	Enter
Scleroderma	1	RQ Insecure Dismissive, Total EMWS[b]	.	Enter

a. Dependent Variable: Transformed SQRT Pain

b. All requested variables entered.

Model Summary[b]

BreastCancerScleroderma	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
.BreastCancer	1	.032[a]	.001	-.104	3.84406
Scleroderma	2	.410[a]	.168	.148	2.55948

a. Predictors: (Constant), RQ Insecure Dismissive, Total EMWS

b. Dependent Variable: Transformed SQRT Pain

ANOVA[a]

BreastCancerScleroderma	Model		Sum of Squares	df	Mean Square	F	Sig.
.BreastCancer	1	Regression	.294	2	.147	.010	.990[b]
		Residual	280.759	19	14.777		
		Total	281.053	21			
Scleroderma	2	Regression	108.784	2	54.392	8.303	.001[b]
		Residual	537.178	82	6.551		
		Total	645.962	84			

a. Dependent Variable: Transformed SQRT Pain

b. Predictors: (Constant), RQ Insecure Dismissive, Total EMWS

Coefficients[a]

BreastCancer Scleroderma	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			To
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	
BreastCancer	1	(Constant)	3.100	3.962		.782	.444	-5.192	11.392				
		Total EMWS	-.001	.031	-.004	-.019	.985	-.065	.064	-.005	-.004	-.004	
		RQ Insecure Dismissive	.028	.204	.032	.139	.891	-.399	.456	.032	.032	.032	
Scleroderma	2	(Constant)	4.832	1.463		3.303	.001	1.922	7.743				
		Total EMWS	-.034	.012	-.291	-2.845	.006	-.057	-.010	-.335	-.300	-.286	
		RQ Insecure Dismissive	.157	.067	.240	2.347	.021	.024	.290	.294	.251	.236	

a. Dependent Variable: Transformed SQRT Pain

Collinearity Diagnostics[a]

BreastCancer Scleroderma	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
					(Constant)	Total EMWS	RQ Insecure Dismissive
		1	2.874	1.000	.01	.01	.01
BreastCancer	1	2	.099	5.397	.02	.75	.22
		3	.027	10.277	.98	.24	.77
		1	2.873	1.000	.00	.01	.01
Scleroderma	2	2	.104	5.262	.00	.55	.27
		3	.023	11.059	.99	.44	.72

a. Dependent Variable: Transformed SQRT Pain

Residuals Statistics[a]

Breast Cancer		Minimum	Maximum	Mean	Std. Deviation	N
	Predicted Value	3.2943	3.7072	3.4926	.11832	22
	Std. Predicted Value	-1.676	1.814	.000	1.000	22
	Standard Error of Predicted Value	.850	1.866	1.384	.322	22
	Adjusted Predicted Value	2.3612	4.3964	3.4727	.62875	22
	Residual	-3.64442	6.56099	.15876	3.66053	22
.	Std. Residual	-.948	1.707	.041	.952	22
	Stud. Residual	-1.037	1.807	.044	1.025	22
	Deleted Residual	-4.39641	7.35439	.17871	4.24954	22
	Stud. Deleted Residual	-1.039	1.933	.052	1.039	22
	Mahal. Distance	.072	3.996	1.909	1.245	22
	Cook's Distance	.000	.134	.055	.039	22
	Centered Leverage Value	.003	.190	.091	.059	22
	Predicted Value	2.8359	7.8560	4.8724	1.13605	85
	Adjusted Predicted Value	2.7901	7.7731	4.8792	1.13708	84
	Residual	-4.91140	4.81736	-.07583	2.51764	84
	Std. Residual	-1.919	1.882	-.030	.984	84
	Stud. Residual	-1.947	1.917	-.030	1.001	84
Scleroderma	Deleted Residual	-5.05613	4.99519	-.07732	2.60847	84
	Stud. Deleted Residual	-1.981	1.949	-.030	1.008	84
	Mahal. Distance	.013	9.712	1.976	1.779	85
	Cook's Distance	.000	.120	.012	.018	84
	Centered Leverage Value	.000	.116	.024	.021	85

a. Dependent Variable: Transformed SQRT Pain

Multiple Regression: Breast Cancer Variables and Psychosocial Variables

Fatigue: Hyper-arousal and Fearful Attachment

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Transformed Total Hyperarousal, Transformed SQRT Fearful Attachment[b]	.	Enter

a. Dependent Variable: Fatigue

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.626[a]	.392	.324	25.718

a. Predictors: (Constant), Transformed Total Hyperarousal, Transformed SQRT Fearful Attachment

b. Dependent Variable: Fatigue

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7675.539	2	3837.770	5.802	.011[b]
	Residual	11905.413	18	661.412		
	Total	19580.952	20			

a. Dependent Variable: Fatigue

b. Predictors: (Constant), Transformed Total Hyperarousal, Transformed SQRT Fearful Attachment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Sta	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	
1	(Constant)	-148.154	55.003		-2.694	.015	-263.710	-32.597					
	Transformed SQRT Fearful Attachment	15.105	8.480	.344	1.781	.092	-2.711	32.922	.476	.387	.327	.905	
	Transformed Total Hyperarousal	14.479	6.541	.428	2.214	.040	.737	28.221	.534	.463	.407	.905	

a. Dependent Variable: Fatigue

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Transformed SQRT Fearful Attachment	Transformed Total Hyperarousal
1	1	2.970	1.000	.00	.00	.00
	2	.025	10.918	.08	.99	.06
	3	.005	23.397	.92	.01	.94

a. Dependent Variable: Fatigue

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-18.68	61.76	27.38	19.590	21
Std. Predicted Value	-2.351	1.755	.000	1.000	21
Standard Error of Predicted Value	5.920	14.690	9.412	2.488	21
Adjusted Predicted Value	-27.72	54.61	26.10	20.287	21
Residual	-48.403	39.999	.000	24.398	21
Std. Residual	-1.882	1.555	.000	.949	21
Stud. Residual	-1.997	1.724	.023	1.022	21
Deleted Residual	-54.501	49.168	1.282	28.401	21
Stud. Deleted Residual	-2.200	1.834	.016	1.055	21
Mahal. Distance	.107	5.573	1.905	1.523	21
Cook's Distance	.000	.227	.056	.063	21
Centered Leverage Value	.005	.279	.095	.076	21

a. Dependent Variable: Fatigue

Multiple Regression: Nausea Breast Cancer – Model Significant -Variables Not Significant

Descriptive Statistics

	Mean	Std. Deviation	N
Nausea	5.65	15.323	23
Dissmisive Attachment Log Transformed	1.1680	.12290	22
Transformed SQRT Fearful Attachment	3.3305	.72292	22

Correlations

		Nausea	Dissmisive Attachment Log Transformed	Transformed SQRT Fearful Attachment
Pearson Correlation	Nausea	1.000	.464	.461
	Dissmisive Attachment Log Transformed	.464	1.000	.493
	Transformed SQRT Fearful Attachment	.461	.493	1.000
Sig. (1-tailed)	Nausea	.	.015	.015
	Dissmisive Attachment Log Transformed	.015	.	.010
	Transformed SQRT Fearful Attachment	.015	.010	.
N	Nausea	23	22	22
	Dissmisive Attachment Log Transformed	22	22	22
	Transformed SQRT Fearful Attachment	22	22	22

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Transformed SQRT Fearful Attachment, Dissmisive Attachment Log Transformed[b]	.	Enter

a. Dependent Variable: Nausea

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.535[a]	.286	.211	13.608

a. Predictors: (Constant), Transformed SQRT Fearful Attachment, Dissmisive Attachment Log Transformed

b. Dependent Variable: Nausea

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1411.905	2	705.952	3.812	.041[b]
	Residual	3518.530	19	185.186		
	Total	4930.435	21			

a. Dependent Variable: Nausea

b. Predictors: (Constant), Transformed SQRT Fearful Attachment, Dissmisive Attachment Log Transformed

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-61.526	28.371		-2.169	.043	-120.907	-2.145					
1 Dissmisive Attachment Log Transformed	38.983	27.773	.313	1.404	.177	-19.147	97.113	.464	.307	.272	.757	1.321
Transformed SQRT Fearful Attachment	6.499	4.722	.307	1.376	.185	-3.383	16.382	.461	.301	.267	.757	1.321

a. Dependent Variable: Nausea

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Dissmisive Attachment Log Transformed	Transformed SQRT Fearful Attachment
1	1	2.971	1.000	.00	.00	.00
	2	.024	11.082	.11	.03	.88
	3	.005	25.037	.88	.97	.12

a. Dependent Variable: Nausea

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-9.13	19.89	5.65	8.200	22
Std. Predicted Value	-1.802	1.736	.000	1.000	22
Standard Error of Predicted Value	3.033	9.188	4.786	1.568	22
Adjusted Predicted Value	-12.46	17.08	5.16	8.330	22
Residual	-15.190	30.867	.257	13.207	22
Std. Residual	-1.116	2.268	.019	.970	22
Stud. Residual	-1.184	2.503	.036	1.051	22
Mahal. Distance	.088	8.619	1.909	2.013	22
Cook's Distance	.001	.473	.063	.132	22
Centered Leverage Value	.004	.410	.091	.096	22

a. Dependent Variable: Nausea

Multiple Regression: Breast Cancer Depression –Nausea -Fatigue

Descriptive Statistics

	Mean	Std. Deviation	N
Depression Log Transformed	1.0347	.17745	21
Nausea	6.19	15.961	21
Fatigue	27.38	31.290	21

Correlations

		Depression Log Transformed	Nausea	Fatigue
Pearson Correlation	Depression Log Transformed	1.000	.442	.616
	Nausea	.442	1.000	.715
	Fatigue	.616	.715	1.000
Sig. (1-tailed)	Depression Log Transformed	.	.022	.001
	Nausea	.022	.	.000
	Fatigue	.001	.000	.
N	Depression Log Transformed	21	21	21
	Nausea	21	21	21
	Fatigue	21	21	21

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Fatigue, Nausea[b]	.	Enter

a. Dependent Variable: Depression Log Transformed

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.616[a]	.379	.310	.14738

a. Predictors: (Constant), Fatigue, Nausea

b. Dependent Variable: Depression Log Transformed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.239	2	.119	5.496	.014[b]
	Residual	.391	18	.022		
	Total	.630	20			

a. Dependent Variable: Depression Log Transformed

b. Predictors: (Constant), Fatigue, Nausea

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.939	.045		21.046	.000	.845	1.033					
	Nausea	4.262E-005	.003	.004	.014	.989	-.006	.006	.442	.003	.003	.489	2.045
	Fatigue	.003	.002	.613	2.308	.033	.000	.007	.616	.478	.429	.489	2.045

a. Dependent Variable: Depression Log Transformed

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Nausea	Fatigue
1	1	2.198	1.000	.07	.06	.05
	2	.633	1.863	.47	.28	.00
	3	.168	3.617	.47	.66	.95

a. Dependent Variable: Depression Log Transformed

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.9392	1.2890	1.0347	.10926	21
Std. Predicted Value	-.874	2.328	.000	1.000	21
Standard Error of Predicted Value	.035	.097	.052	.020	21
Adjusted Predicted Value	.9184	1.2632	1.0330	.10574	21
Residual	-.24474	.35440	.00000	.13982	21
Std. Residual	-1.661	2.405	.000	.949	21
Stud. Residual	-1.896	2.491	.004	1.025	21
Deleted Residual	-.31919	.38045	.00170	.16445	21
Stud. Deleted Residual	-2.060	2.991	.018	1.116	21
Mahal. Distance	.154	7.797	1.905	2.367	21
Cook's Distance	.000	.365	.062	.103	21
Centered Leverage Value	.008	.390	.095	.118	21

a. Dependent Variable: Depression Log Transformed

Multiple Regression Analysis: Scleroderma and Breast Cancer – Anxiety Depression Stress - Biopsychosocial

Anxiety Breast Cancer and Scleroderma - Split File

Descriptive Statistics

SclerodermaBreastCancer		Mean	Std. Deviation	N
	Transformed Inverse Anxiety	.0000	.	0
	Transformed SQRT Pain	.0000	.	0
	ERQ Suppresion	.0000	.	0
	Total EMWS	.0000	.	0
	Hyperarousal	.0000	.	0
	Transformed Inverse Anxiety	.0995	.02873	93
	Transformed SQRT Pain	4.8859	2.77309	92
Scleroderma	ERQ Suppresion	14.5062	5.56130	81
	Total EMWS	70.0284	23.94298	88
	Hyperarousal	73.6410	15.92513	78
	Transformed Inverse Anxiety	.1063	.02470	22
	Transformed SQRT Pain	3.4926	3.65834	23
BreastCancer	ERQ Suppresion	14.5909	5.36886	22
	Total EMWS	71.9091	27.12038	22
	Hyperarousal	74.9091	15.35581	22

Variables Entered/Removed[a,b]

Scleroderma BreastCancer	Model	Variables Entered	Variables Removed	Method
Scleroderma	1	Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS[c]	.	Enter
BreastCancer	2	Hyperarousal, Transformed SQRT Pain, Total EMWS, ERQ Suppresion[c]	.	Enter

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Transformed Inverse Anxiety

c. All requested variables entered.

Model Summary[a,c]

Scleroderma BreastCancer	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Scleroderma	1	.666[b]	.444	.413	.02202
Breast Cancer	2	.615[d]	.378	.232	.02165

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS

c. Dependent Variable: Transformed Inverse Anxiety

d. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, Total EMWS, ERQ Suppresion

ANOVA[a,b]

Scleroderma BreastCancer	Model		Sum of Squares	df	Mean Square	F	Sig.
Scleroderma	1	Regression	.027	4	.007	14.180	.000[c]
		Residual	.034	71	.000		
		Total	.062	75			
BreastCancer	2	Regression	.005	4	.001	2.586	.074[d]
		Residual	.008	17	.000		
		Total	.013	21			

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Transformed Inverse Anxiety

c. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS

d. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, Total EMWS, ERQ Suppresion

Coefficients[a,b]

ScleroBC	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
			B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
Scleroderma	1	(Constant)	.153	.020		7.781	.000					
		Transformed SQRT Pain	-.003	.001	-.262	-2.774	.007	-.344	-.313	-.245	.879	1.138
		Total EMWS	.000	.000	.269	2.709	.008	.443	.306	.240	.793	1.261
		ERQ Suppresion	-.002	.000	-.336	-3.773	.000	-.354	-.409	-.334	.986	1.014
		Hyperarousal	-.001	.000	-.284	-3.012	.004	-.408	-.337	-.266	.883	1.132
Breast Cancer	2	(Constant)	.182	.033		5.501	.000					
		Transformed SQRT Pain	-.001	.001	-.130	-.613	.548	-.356	-.147	-.117	.812	1.232
		Total EMWS	.000	.000	-.119	-.601	.556	.019	-.144	-.115	.928	1.077
		ERQ Suppresion	-.002	.001	-.527	-2.408	.028	-.538	-.504	-.461	.763	1.311
		Hyperarousal	.000	.000	-.244	-1.265	.223	-.206	-.293	-.242	.986	1.014

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Transformed Inverse Anxiety

Collinearity Diagnostics[a,b]

Scleroderma BreastCancer	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
					(Constant)	Transformed SQRT Pain	ERQ Suppresion	Total EMWS	Hyperarousal
		1	4.555	1.000	.00	.01	.01	.00	.00
		2	.249	4.280	.00	.63	.02	.07	.00
Scleroderma	1	3	.113	6.348	.00	.03	.63	.28	.00
		4	.072	7.966	.01	.16	.31	.17	.31
		5	.012	19.582	.98	.17	.03	.48	.69
		1	4.360	1.000	.00	.01	.00	.01	.00
		2	.435	3.166	.00	.76	.00	.02	.00
BreastCancer	2	3	.130	5.799	.00	.13	.29	.44	.00
		4	.062	8.403	.01	.07	.45	.30	.29
		5	.014	17.970	.98	.02	.25	.23	.70

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Transformed Inverse Anxiety

Residuals Statistics[a,b]

SclerodermaBreastCancer		Minimum	Maximum	Mean	Std. Deviation	N
Scleroderma	Predicted Value	.0360	.1340	.0995	.01932	75
	Std. Predicted Value	-3.317	1.801	-.002	1.009	75
	Standard Error of Predicted Value	.003	.009	.005	.001	75
	Adjusted Predicted Value	.0339	.1353	.0994	.01948	75
	Residual	-.04411	.05902	.00171	.02137	75
	Std. Residual	-2.004	2.681	.077	.971	75
	Stud. Residual	-2.058	2.736	.078	1.000	75
	Deleted Residual	-.04654	.06145	.00174	.02270	75
	Stud. Deleted Residual	-2.107	2.872	.081	1.013	75
	Mahal. Distance	.432	12.650	3.921	2.295	75
	Cook's Distance	.000	.085	.012	.016	75
	Centered Leverage Value	.006	.169	.052	.031	75
BreastCancer	Predicted Value	.0814	.1350	.1061	.01520	22
	Std. Predicted Value	-1.638	1.888	-.009	1.000	22
	Standard Error of Predicted Value	.008	.013	.010	.002	22
	Adjusted Predicted Value	.0816	.1359	.1054	.01622	22
	Residual	-.03448	.03168	.00014	.01948	22
	Std. Residual	-1.593	1.463	.006	.900	22
	Stud. Residual	-1.711	1.660	.021	1.018	22

	Deleted Residual	-.03979	.04279	.00083	.02505	22
	Stud. Deleted Residual	-1.824	1.760	.030	1.050	22
	Mahal. Distance	1.672	6.578	3.823	1.543	22
	Cook's Distance	.000	.230	.058	.059	22
	Centered Leverage Value	.080	.313	.182	.073	22

a. There are no valid cases in one or more split files. Statistics cannot be computed.

b. Dependent Variable: Transformed Inverse Anxiety

Multiple Regression Analysis: Anxiety - Breast Cancer

Descriptive Statistics[a]

	Mean	Std. Deviation	N
Transformed Inverse Anxiety	.1063	.02470	22
Transformed SQRT Pain	3.4926	3.65834	23
ERQ Suppresion	14.5909	5.36886	22

a. ScleroBC = Breast Cancer

Correlations[a]

		Transformed Inverse Anxiety	Transformed SQRT Pain	ERQ Suppresion
Pearson Correlation	Transformed Inverse Anxiety	1.000	-.356	-.538
	Transformed SQRT Pain	-.356	1.000	.419
	ERQ Suppresion	-.538	.419	1.000
Sig. (1-tailed)	Transformed Inverse Anxiety	.	.052	.005
	Transformed SQRT Pain	.052	.	.026
	ERQ Suppresion	.005	.026	.
N	Transformed Inverse Anxiety	22	22	22
	Transformed SQRT Pain	22	23	22
	ERQ Suppresion	22	22	22

a. ScleroBC = Breast Cancer

Variables Entered/Removed[a,b]

Model	Variables Entered	Variables Removed	Method
1	ERQ Suppresion, Transformed SQRT Pain[c]	.	Enter

a. ScleroBC = Breast Cancer

b. Dependent Variable: Transformed Inverse Anxiety

c. All requested variables entered.

Model Summary[a,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.557[b]	.311	.238	.02156

a. ScleroBC = Breast Cancer

b. Predictors: (Constant), ERQ Suppresion, Transformed SQRT Pain

c. Dependent Variable: Transformed Inverse Anxiety

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.004	2	.002	4.281	.029[c]
	Residual	.009	19	.000		
	Total	.013	21			

a. ScleroBC = Breast Cancer

b. Dependent Variable: Transformed Inverse Anxiety

c. Predictors: (Constant), ERQ Suppresion, Transformed SQRT Pain

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.142	.014		10.401	.000					
	Transformed SQRT Pain	-.001	.001	-.159	-.756	.459	-.356	-.171	-.144	.824	1.213
	ERQ Suppresion	-.002	.001	-.472	-2.250	.037	-.538	-.459	-.428	.824	1.213

a. ScleroBC = Breast Cancer

b. Dependent Variable: Transformed Inverse Anxiety

Collinearity Diagnostics[a,b]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Transformed SQRT Pain	ERQ Suppresion
1	1	2.604	1.000	.02	.05	.01
	2	.342	2.760	.07	.86	.02
	3	.054	6.930	.91	.09	.96

a. ScleroBC = Breast Cancer

b. Dependent Variable: Transformed Inverse Anxiety

Residuals Statistics[a,b]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0856	.1330	.1061	.01377	22
Std. Predicted Value	-1.499	1.942	-.012	1.000	22
Standard Error of Predicted Value	.005	.011	.008	.002	22
Adjusted Predicted Value	.0809	.1396	.1057	.01440	22
Residual	-.03235	.03479	.00017	.02051	22
Std. Residual	-1.500	1.613	.008	.951	22
Stud. Residual	-1.583	1.737	.016	1.025	22
Deleted Residual	-.03603	.04031	.00056	.02391	22
Stud. Deleted Residual	-1.654	1.843	.027	1.049	22
Mahal. Distance	.118	4.920	1.914	1.385	22
Cook's Distance	.000	.278	.057	.067	22
Centered Leverage Value	.006	.234	.091	.066	22

a. ScleroBC = Breast Cancer

b. Dependent Variable: Transformed Inverse Anxiety

Multiple Regression Analysis: Total Illness (Scleroderma/BC) - Anxiety

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed Inverse Anxiety	.1008	.02803	115
Transformed SQRT Pain	4.6072	3.00576	115
ERQ Suppresion	14.5243	5.49482	103
Total EMWS	70.4045	24.49157	110
Hyperarousal	73.9200	15.73369	100

Correlations

		Transformed Inverse Anxiety	Transformed SQRT Pain	ERQ Suppresion	Total EMWS	Hyperarousal
Pearson Correlation	Transformed Inverse Anxiety	1.000	-.351	-.384	.361	-.365
	Transformed SQRT Pain	-.351	1.000	.075	-.249	.014
	ERQ Suppresion	-.384	.075	1.000	-.048	.072
	Total EMWS	.361	-.249	-.048	1.000	-.251
	Hyperarousal	-.365	.014	.072	-.251	1.000
Sig. (1-tailed)	Transformed Inverse Anxiety	.	.000	.000	.000	.000
	Transformed SQRT Pain	.000	.	.226	.005	.446
	ERQ Suppresion	.000	.226	.	.318	.239
	Total EMWS	.000	.005	.318	.	.006
	Hyperarousal	.000	.446	.239	.006	.
N	Transformed Inverse Anxiety	115	114	103	110	100
	Transformed SQRT Pain	114	115	102	109	99

	ERQ Suppresion	103	102	103	100	100
	Total EMWS	110	109	100	110	98
	Hyperarousal	100	99	100	98	100

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS[b]	.	Enter

a. Dependent Variable: Transformed Inverse Anxiety

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.634[a]	.402	.376	.02214

a. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS

b. Dependent Variable: Transformed Inverse Anxiety

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.031	4	.008	15.611	.000[b]
	Residual	.046	93	.000		
	Total	.076	97			

a. Dependent Variable: Transformed Inverse Anxiety

b. Predictors: (Constant), Hyperarousal, Transformed SQRT Pain, ERQ Suppresion, Total EMWS

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.158	.016		9.702	.000	.126	.191					
Transformed SQRT Pain	-.003	.001	-.270	-3.252	.002	-.004	-.001	-.351	-.320	-.261	.931	1.074
1 ERQ Suppresion	-.002	.000	-.333	-4.135	.000	-.003	-.001	-.384	-.394	-.332	.989	1.011
Total EMWS	.000	.000	.206	2.403	.018	.000	.000	.361	.242	.193	.876	1.141
Hyperarousal	-.001	.000	-.286	-3.438	.001	-.001	.000	-.365	-.336	-.276	.930	1.075

a. Dependent Variable: Transformed Inverse Anxiety

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Transformed SQRT Pain	ERQ Suppresion	Total EMWS	Hyperarousal
	1	4.517	1.000	.00	.01	.01	.00	.00
	2	.279	4.023	.00	.77	.01	.06	.00
1	3	.116	6.243	.00	.07	.61	.31	.00
	4	.075	7.758	.02	.07	.33	.24	.28
	5	.013	18.389	.98	.08	.05	.39	.71

a. Dependent Variable: Transformed Inverse Anxiety

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0420	.1404	.1009	.01792	97
Std. Predicted Value	-3.312	2.231	.003	1.009	97
Standard Error of Predicted Value	.003	.008	.005	.001	97
Adjusted Predicted Value	.0414	.1402	.1008	.01804	97
Residual	-.04435	.05568	.00148	.02161	97
Std. Residual	-2.003	2.515	.067	.976	97
Stud. Residual	-2.039	2.556	.068	1.000	97
Deleted Residual	-.04594	.05752	.00152	.02268	97
Stud. Deleted Residual	-2.075	2.637	.070	1.008	97
Mahal. Distance	.385	13.021	3.963	2.354	97
Cook's Distance	.000	.083	.010	.013	97
Centered Leverage Value	.004	.134	.041	.024	97

a. Dependent Variable: Transformed Inverse Anxiety

Multiple Regression - Total Illness Sample (Scleroderma/BC) - Depression

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed Inverse Depression	.0978	.03075	114
Hyperarousal	73.9200	15.73369	100
Self Compassion	82.7059	17.28308	102
ERQ Suppresion	14.5243	5.49482	103
Transformed SQRT Fearful Attachment	3.0525	.63150	108
RQ Insecure Dismissive	15.3761	4.20271	109
Total EMWS	70.4045	24.49157	110

Correlations

		Transformed Inverse Depression	Hyperarousal	Self Compassion	ERQ Suppresion	Transformed SQRT Fearful Attachment	RQ Insecure Dismissive	Total EMWS
Pearson Correlation	Transformed Inverse Depression	1.000	-.410	.397	-.279	-.343	-.337	.370
	Hyperarousal	-.410	1.000	-.437	.072	.311	.264	-.251
	Self Compassion	.397	-.437	1.000	-.072	-.243	-.125	.320
	ERQ Suppresion	-.279	.072	-.072	1.000	.353	.219	-.048
	Transformed SQRT Fearful Attachment	-.343	.311	-.243	.353	1.000	.536	-.321
	RQ Insecure Dismissive	-.337	.264	-.125	.219	.536	1.000	-.149
	Total EMWS	.370	-.251	.320	-.048	-.321	-.149	1.000
Sig. (1-tailed)	Transformed Inverse Depression	.	.000	.000	.002	.000	.000	.000
	Hyperarousal	.000	.	.000	.239	.001	.004	.006
	Self Compassion	.000	.000	.	.235	.007	.105	.001
	ERQ Suppresion	.002	.239	.235	.	.000	.014	.318
	Transformed SQRT Fearful Attachment	.000	.001	.007	.000	.	.000	.000
	RQ Insecure Dismissive	.000	.004	.105	.014	.000	.	.063
	Total EMWS	.000	.006	.001	.318	.000	.063	.
N	Transformed Inverse Depression	114	99	101	102	107	108	110
	Hyperarousal	99	100	99	100	98	99	98
	Self Compassion	101	99	102	102	101	102	100
	ERQ Suppresion	102	100	102	103	101	102	100
	Transformed SQRT Fearful Attachment	107	98	101	101	108	108	106
	RQ Insecure Dismissive	108	99	102	102	108	109	107
	Total EMWS	110	98	100	100	106	107	110

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Total EMWS, ERQ Suppresion, Hyperarousal, RQ Insecure Dismissive, Self Compassion, Transformed SQRT Fearful Attachment[b]	.	Enter

a. Dependent Variable: Transformed Inverse Depression

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.601[a]	.361	.319	.02537

a. Predictors: (Constant), Total EMWS, ERQ Suppresion, Hyperarousal, RQ Insecure Dismissive, Self Compassion, Transformed SQRT Fearful Attachment

b. Dependent Variable: Transformed Inverse Depression

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.033	6	.006	8.580	.000[b]
	Residual	.059	91	.001		
	Total	.092	97			

a. Dependent Variable: Transformed Inverse Depression

b. Predictors: (Constant), Total EMWS, ERQ Suppresion, Hyperarousal, RQ Insecure Dismissive, Self Compassion, Transformed SQRT Fearful Attachment

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.114	.028		4.129	.000	.059	.169					
Hyperarousal	.000	.000	-.207	-2.131	.036	-.001	.000	-.410	-.218	-.179	.745	1.343
Self Compassion	.000	.000	.201	2.085	.040	.000	.001	.397	.214	.175	.757	1.322
ERQ Suppresion	-.001	.001	-.203	-2.255	.027	-.002	.000	-.279	-.230	-.189	.868	1.152
Transformed SQRT Fearful Attachment	.001	.005	.013	.116	.908	-.010	.011	-.343	.012	.010	.579	1.728
RQ Insecure Dismissive	-.001	.001	-.187	-1.866	.065	-.003	.000	-.337	-.192	-.156	.698	1.433
Total EMWS	.000	.000	.220	2.389	.019	.000	.001	.370	.243	.200	.825	1.212

a. Dependent Variable: Transformed Inverse Depression

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Hyperarousal	Self Compassion	ERQ Suppresion	Transformed SQRT Fearful Attachment	RQ Insecure Dismissive	Total EMWS
1	1	6.643	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.148	6.694	.00	.01	.02	.12	.01	.02	.33
	3	.093	8.436	.00	.04	.00	.78	.01	.05	.04
	4	.046	12.071	.00	.11	.41	.00	.00	.01	.43
	5	.043	12.444	.01	.26	.00	.00	.00	.62	.06
	6	.020	18.162	.00	.18	.06	.09	.82	.29	.06
	7	.007	31.707	.98	.40	.50	.00	.16	.01	.08

a. Dependent Variable: Transformed Inverse Depression

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0296	.1280	.0977	.01876	97
Std. Predicted Value	-3.690	1.635	-.007	1.015	97
Standard Error of Predicted Value	.004	.012	.007	.002	97
Adjusted Predicted Value	.0282	.1336	.0978	.01907	97
Residual	-.04854	.07458	-.00026	.02401	97
Std. Residual	-1.913	2.940	-.010	.946	97
Stud. Residual	-1.965	3.139	-.012	.986	97
Deleted Residual	-.05122	.08502	-.00036	.02606	97
Stud. Deleted Residual	-1.997	3.305	-.010	.997	97
Mahal. Distance	1.227	20.161	6.092	3.479	97
Cook's Distance	.000	.197	.012	.024	97
Centered Leverage Value	.013	.208	.063	.036	97

a. Dependent Variable: Transformed Inverse Depression

Multiple Regression Analysis: Scleroderma - Depression

Descriptive Statistics[a]

	Mean	Std. Deviation	N
Transformed Inverse Depression	.0977	.03012	92
Total EMWS	70.0284	23.94298	88
Self Compassion	83.1500	17.94725	80
RQ Insecure Dismissive	15.4023	4.24938	87
ERQ Suppresion	14.5062	5.56130	81
Trnasform SQRT RQ Fear	2.9814	.58973	86

a. Scleroderma = Scleroderma

Correlations[a]

		Transformed Inverse Depression	Total EMWS	Self Compassion	RQ Insecure Dismissive	ERQ Suppresion	Trnasform SQRT RQ Fear
Pearson Correlation	Transformed Inverse Depression	1.000	.374	.372	-.278	-.262	-.364
	Total EMWS	.374	1.000	.340	-.183	.007	-.360
	Self Compassion	.372	.340	1.000	-.102	-.096	-.260
	RQ Insecure Dismissive	-.278	-.183	-.102	1.000	.247	.580
	ERQ Suppresion	-.262	.007	-.096	.247	1.000	.309
	Trnasform SQRT RQ Fear	-.364	-.360	-.260	.580	.309	1.000
Sig. (1-tailed)	Transformed Inverse Depression	.	.000	.000	.005	.010	.000
	Total EMWS	.000	.	.001	.047	.475	.000
	Self Compassion	.000	.001	.	.185	.198	.010
	RQ Insecure Dismissive	.005	.047	.185	.	.014	.000
	ERQ Suppresion	.010	.475	.198	.014	.	.003
	Trnasform SQRT RQ Fear	.000	.000	.010	.000	.003	.
N	Transformed Inverse Depression	92	88	79	86	80	85
	Total EMWS	88	88	78	85	78	84
	Self Compassion	79	78	80	80	80	79
	RQ Insecure Dismissive	86	85	80	87	80	86
	ERQ Suppresion	80	78	80	80	81	79
	Trnasform SQRT RQ Fear	85	84	79	86	79	86

a. Scleroderma = Scleroderma

Variables Entered/Removed[a,b]

Model	Variables Entered	Variables Removed	Method
1	Trnasform SQRT RQ Fear, Self Compassion, ERQ Suppresion, Total EMWS, RQ Insecure Dismissive[c]	.	Enter

a. Scleroderma = Scleroderma

b. Dependent Variable: Transformed Inverse Depression

c. All requested variables entered.

Model Summary[a,c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.540[b]	.291	.242	.02622

a. Scleroderma = Scleroderma

b. Predictors: (Constant), Trnasform SQRT RQ Fear, Self Compassion, ERQ Suppresion, Total EMWS, RQ Insecure Dismissive

c. Dependent Variable: Transformed Inverse Depression

ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.020	5	.004	5.916	.000[c]
	Residual	.050	72	.001		
	Total	.070	77			

a. Scleroderma = Scleroderma

b. Dependent Variable: Transformed Inverse Depression

c. Predictors: (Constant), Trnasform SQRT RQ Fear, Self Compassion, ERQ Suppresion, Total EMWS, RQ Insecure Dismissive

Coefficients[a,b]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.085	.026		3.210	.002	.032	.137					
Total EMWS	.000	.000	.240	2.147	.035	.000	.001	.374	.245	.213	.789	1.268
Self Compassion	.000	.000	.237	2.209	.030	.000	.001	.372	.252	.219	.857	1.167
RQ Insecure Dismissive	-.001	.001	-.109	-.888	.378	-.003	.001	-.278	-.104	-.088	.656	1.525
ERQ Suppresion	-.001	.001	-.184	-1.737	.087	-.002	.000	-.262	-.201	-.172	.879	1.138
Trnasform SQRT RQ Fear	-.005	.007	-.096	-.722	.473	-.019	.009	-.364	-.085	-.072	.551	1.814

a. Scleroderma = Scleroderma b. Dependent Variable: Transformed Inverse Depression

Collinearity Diagnostics[a,b]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	Total EMWS	Self Compassion	RQ Insecure Dismissive	ERQ Suppresion	Trnasform SQRT RQ Fear
1	1	5.693	1.000	.00	.00	.00	.00	.00	.00
	2	.142	6.325	.00	.27	.03	.03	.17	.01
	3	.090	7.950	.00	.08	.01	.09	.74	.02
	4	.041	11.715	.01	.50	.43	.25	.03	.00
	5	.025	15.217	.07	.02	.24	.58	.06	.32
	6	.009	25.466	.92	.13	.29	.04	.00	.65

a. Scleroderma = Scleroderma b. Dependent Variable: Transformed Inverse Depression

Residuals Statistics[a,b]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.0438	.1260	.0974	.01642	77
Std. Predicted Value	-3.314	1.745	-.015	1.010	77
Standard Error of Predicted Value	.004	.013	.007	.002	77
Adjusted Predicted Value	.0451	.1280	.0975	.01676	77
Residual	-.05309	.07845	-.00019	.02442	77
Std. Residual	-2.025	2.992	-.007	.931	77
Stud. Residual	-2.070	3.190	-.009	.974	77
Deleted Residual	-.05550	.08917	-.00029	.02674	77
Stud. Deleted Residual	-2.120	3.418	-.006	.991	77
Mahal. Distance	.702	19.402	4.986	3.293	77
Cook's Distance	.000	.232	.015	.031	77
Centered Leverage Value	.009	.252	.065	.043	77

a. Scleroderma = Scleroderma

b. Dependent Variable: Transformed Inverse Depression

Multiple Regression Analysis: Breast Cancer - Depression

Descriptive Statistics

	Mean	Std. Deviation	N
Depression Log Transformed	1.0367	.17343	22
Dissmisive Attachment Log Transformed	1.1680	.12290	22
Self Compassion SQRT Transformed	8.9676	.84018	22

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Self Compassion SQRT Transformed, Dissmisive Attachment Log Transformed[b]	.	Enter

a. Dependent Variable: Depression Log Transformed

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.667[a]	.445	.386	.13589

a. Predictors: (Constant), Self Compassion SQRT Transformed, Dissmisive Attachment Log Transformed

b. Dependent Variable: Depression Log Transformed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.281	2	.140	7.604	.004[b]
	Residual	.351	19	.018		
	Total	.632	21			

a. Dependent Variable: Depression Log Transformed

b. Predictors: (Constant), Self Compassion SQRT Transformed, Dissmisive Attachment Log Transformed

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.974	.477		2.041	.055	-.025	1.973					
Dissmisive Attachment Log Transformed	.663	.247	.470	2.687	.015	.147	1.180	.551	.525	.459	.956	1.046
Self Compassion SQRT Transformed	-.079	.036	-.385	-2.199	.040	-.155	-.004	-.483	-.450	-.376	.956	1.046

a. Dependent Variable: Depression Log Transformed

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Dissmisive Attachment Log Transformed	Self Compassion SQRT Transformed
1	1	2.986	1.000	.00	.00	.00
	2	.011	16.195	.00	.47	.32
	3	.002	34.958	1.00	.53	.68

a. Dependent Variable: Depression Log Transformed

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.8198	1.2322	1.0367	.11564	22
Std. Predicted Value	-1.875	1.691	.000	1.000	22
Standard Error of Predicted Value	.029	.074	.049	.013	22
Adjusted Predicted Value	.7894	1.2789	1.0387	.11931	22
Residual	-.19084	.31744	.00000	.12925	22
Std. Residual	-1.404	2.336	.000	.951	22
Stud. Residual	-1.567	2.400	-.007	1.013	22
Deleted Residual	-.23747	.33497	-.00201	.14713	22
Stud. Deleted Residual	-1.634	2.798	.006	1.070	22
Mahal. Distance	.027	5.269	1.909	1.468	22
Cook's Distance	.000	.200	.046	.051	22
Centered Leverage Value	.001	.251	.091	.070	22

a. Dependent Variable: Depression Log Transformed

Multiple Regression Analysis: Total sample (Scleroderma/BC) - Stress

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed SQRT Stress	3.4450	.50685	114
Hyperarousal	73.9200	15.73369	100
Total EMWS	70.4045	24.49157	110
Transformed SQRT Fearful Attachment	3.0525	.63150	108
Self Compassion	82.7059	17.28308	102
RQ Insecure Dismissive	15.3761	4.20271	109

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RQ Insecure Dismissive, Self Compassion, Total EMWS, Hyperarousal, Transformed SQRT Fearful Attachment[b]	.	Enter

a. Dependent Variable: Transformed SQRT Stress

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.594[a]	.353	.317	.41873

a. Predictors: (Constant), RQ Insecure Dismissive, Self Compassion, Total EMWS, Hyperarousal, Transformed SQRT Fearful Attachment

b. Dependent Variable: Transformed SQRT Stress

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.788	5	1.758	10.024	.000[b]
	Residual	16.131	92	.175		
	Total	24.919	97			

a. Dependent Variable: Transformed SQRT Stress

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	3.252	.455		7.142	.000	2.348	4.157					
Hyperarousal	.012	.003	.388	3.991	.000	.006	.019	.518	.384	.335	.746	1.340
Total EMWS	-.002	.002	-.097	-1.049	.297	-.006	.002	-.285	-.109	-.088	.829	1.207
Transformed SQRT Fearful Attachment	.070	.085	.087	.823	.413	-.098	.238	.240	.085	.069	.633	1.579
Self Compassion	-.007	.003	-.248	-2.567	.012	-.013	-.002	-.455	-.259	-.215	.757	1.321
RQ Insecure Dismissive	-.013	.012	-.109	-1.083	.282	-.037	.011	.085	-.112	-.091	.699	1.431

a. Dependent Variable: Transformed SQRT Stress

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	Hyperarousal	Total EMWS	Transformed SQRT Fearful Attachment	Self Compassion	RQ Insecure Dismissive
1	1	5.746	1.000	.00	.00	.00	.00	.00	.00
	2	.138	6.463	.00	.02	.37	.02	.02	.05
	3	.046	11.223	.00	.12	.42	.00	.40	.01
	4	.043	11.558	.01	.27	.07	.00	.01	.60
	5	.022	16.290	.00	.19	.06	.78	.07	.34
	6	.007	29.465	.99	.40	.08	.19	.50	.01

a. Dependent Variable: Transformed SQRT Stress

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.8169	4.4524	3.4500	.30450	97
Std. Predicted Value	-2.087	3.347	.017	1.012	97
Standard Error of Predicted Value	.062	.186	.102	.025	97
Adjusted Predicted Value	2.8158	4.4489	3.4485	.30944	97
Residual	-.97835	.97811	.01568	.40808	97
Std. Residual	-2.336	2.336	.037	.975	97
Stud. Residual	-2.393	2.444	.039	1.010	97
Deleted Residual	-1.02625	1.07075	.01723	.43854	97
Stud. Deleted Residual	-2.458	2.514	.040	1.020	97
Mahal. Distance	1.157	18.171	5.114	3.153	97
Cook's Distance	.000	.169	.013	.024	97
Centered Leverage Value	.012	.187	.053	.033	97

a. Dependent Variable: Transformed SQRT Stress

Multiple Regression Analysis: Scleroderma – Stress

Descriptive Statistics

	Mean	Std. Deviation	N
Transformed SQRT Stress	3.4489	.52086	92
Total EMWS	70.0284	23.94298	88
Transformed SQRT Fearful Attachment	2.9814	.58973	86
Hyperarousal	73.6410	15.92513	78
Self Compassion	83.1500	17.94725	80

Model	Variables Entered	Variables Removed	Method
1	Self Compassion, Transformed SQRT Fearful Attachment, Total EMWS, Hyperarousal[b]	.	Enter

a. Dependent Variable: Transformed SQRT Stress

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.577[a]	.333	.296	.43715

a. Predictors: (Constant), Self Compassion, Transformed SQRT Fearful Attachment, Total EMWS, Hyperarousal

b. Dependent Variable: Transformed SQRT Stress

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.779	4	1.695	8.869	.000[b]
	Residual	13.568	71	.191		
	Total	20.347	75			

a. Dependent Variable: Transformed SQRT Stress

b. Predictors: (Constant), Self Compassion, Transformed SQRT Fearful Attachment, Total EMWS, Hyperarousal

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	3.414	.549		6.221	.000	2.319	4.508					
Total EMWS	-.003	.002	-.155	-1.426	.158	-.008	.001	-.345	-.167	-.138	.791	1.265
Transformed SQRT Fearful Attachment	.000	.095	.000	-.002	.998	-.189	.189	.231	.000	.000	.816	1.226
Hyperarousal	.011	.004	.351	3.149	.002	.004	.019	.500	.350	.305	.757	1.321
Self Compassion	-.007	.003	-.237	-2.143	.036	-.013	.000	-.439	-.246	-.208	.767	1.304

a. Dependent Variable: Transformed SQRT Stress

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	Total EMWS	Transformed SQRT Fearful Attachment	Hyperarousal	Self Compassion
1	1	4.802	1.000	.00	.00	.00	.00	.00
	2	.123	6.252	.00	.36	.04	.06	.02
	3	.044	10.461	.00	.42	.00	.14	.44
	4	.025	13.816	.00	.08	.68	.44	.11
	5	.007	27.164	1.00	.13	.28	.36	.43

a. Dependent Variable: Transformed SQRT Stress

Multiple Regression Analysis: Breast Cancer – Stress - Model Significant (Variables Not Significant)

Descriptive Statistics

	Mean	Std. Deviation	N
Total Stress DASS	11.9545	3.18445	22
RSQ Dismissing attachment subscale	15.2727	4.10785	22
Total Hyperarousal	74.9091	15.35581	22
Self Compassion SQRT Transformed	8.9676	.84018	22

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Self Compassion SQRT Transformed, RSQ Dismissing attachment subscale, Total Hyperarousal[b]	.	Enter

a. Dependent Variable: Total Stress DASS

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.717[a]	.515	.434	2.39611

a. Predictors: (Constant), Self Compassion SQRT Transformed, RSQ Dismissing attachment subscale, Total Hyperarousal

b. Dependent Variable: Total Stress DASS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	109.611	3	36.537	6.364	.004[b]
	Residual	103.344	18	5.741		
	Total	212.955	21			

a. Dependent Variable: Total Stress DASS

b. Predictors: (Constant), Self Compassion SQRT Transformed, RSQ Dismissing attachment subscale, Total Hyperarousal

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	12.375	8.425		1.469	.159	-5.325	30.075					
RSQ Dismissing attachment subscale	.190	.138	.244	1.372	.187	-.101	.480	.467	.308	.225	.849	1.179
Total Hyperarousal	.083	.041	.398	2.012	.059	-.004	.169	.629	.429	.330	.688	1.454
Self Compassion SQRT Transformed	-1.060	.716	-.280	-1.480	.156	-2.565	.445	-.536	-.329	-.243	.755	1.325

a. Dependent Variable: Total Stress DASS

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	RSQ Dismissing attachment subscale	Total Hyperarousal	Self Compassion SQRT Transformed
1	1	3.918	1.000	.00	.00	.00	.00
	2	.050	8.823	.01	.60	.01	.04
	3	.029	11.563	.00	.38	.63	.02
	4	.002	41.193	.99	.02	.36	.94

a. Dependent Variable: Total Stress DASS

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	8.7457	16.1741	11.9545	2.28464	22
Std. Predicted Value	-1.405	1.847	.000	1.000	22
Standard Error of Predicted Value	.609	1.378	1.001	.211	22
Adjusted Predicted Value	7.9903	15.6565	11.9067	2.35354	22
Residual	-4.24944	4.22849	.00000	2.21836	22
Std. Residual	-1.773	1.765	.000	.926	22
Stud. Residual	-1.920	2.157	.008	1.044	22
Deleted Residual	-4.98103	6.32011	.04780	2.83483	22
Stud. Deleted Residual	-2.093	2.435	.010	1.093	22
Mahal. Distance	.401	5.995	2.864	1.535	22
Cook's Distance	.000	.576	.074	.123	22
Centered Leverage Value	.019	.285	.136	.073	22

a. Dependent Variable: Total Stress DASS

Multiple Regression Analysis: Scleroderma and Breast Cancer – Age Diagnosed - Psychosocial Variables

Total Illness Sample (Scleroderma and Breast Cancer)

Descriptive Statistics

	Mean	Std. Deviation	N
AgeDiagBCSclero	47.60	11.119	114
Hyperarousal	73.9200	15.73369	100
Self Compassion	82.7059	17.28308	102
Transformed SQRT Stress	3.4450	.50685	114

Correlations

		AgeDiagBCSclero	Hyperarousal	Self Compassion	Transformed SQRT Stress
Pearson Correlation	AgeDiagBCSclero	1.000	-.300	.221	-.248
	Hyperarousal	-.300	1.000	-.437	.518
	Self Compassion	.221	-.437	1.000	-.455
	Transformed SQRT Stress	-.248	.518	-.455	1.000
Sig. (1-tailed)	AgeDiagBCSclero	.	.002	.015	.005
	Hyperarousal	.002	.	.000	.000
	Self Compassion	.015	.000	.	.000
	Transformed SQRT Stress	.005	.000	.000	.
N	AgeDiagBCSclero	114	95	97	109
	Hyperarousal	95	100	99	99
	Self Compassion	97	99	102	102
	Transformed SQRT Stress	109	99	102	114

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Transformed SQRT Stress, Self Compassion, Hyperarousal[b]	.	Enter

a. Dependent Variable: AgeDiagBCSclero

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.327[a]	.107	.077	10.681

a. Predictors: (Constant), Transformed SQRT Stress, Self Compassion, Hyperarousal

b. Dependent Variable: AgeDiagBCSclero

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1239.362	3	413.121	3.621	.016[b]
	Residual	10381.233	91	114.079		
	Total	11620.595	94			

a. Dependent Variable: AgeDiagBCSclero

b. Predictors: (Constant), Transformed SQRT Stress, Self Compassion, Hyperarousal

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	61.770	13.049		4.734	.000	35.850	87.690					
Hyperarousal	-.149	.085	-.211	-1.760	.082	-.318	.019	-.300	-.181	-.174	.680	1.470
Self Compassion	.054	.074	.083	.723	.472	-.094	.201	.221	.076	.072	.738	1.356
Transformed SQRT Stress	-2.196	2.662	-.100	-.825	.412	-7.484	3.092	-.248	-.086	-.082	.667	1.500

a. Dependent Variable: AgeDiagBCSclero

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Hyperarousal	Self Compassion	Transformed SQRT Stress
1	1	3.913	1.000	.00	.00	.00	.00
	2	.067	7.650	.00	.14	.27	.02
	3	.015	15.956	.02	.83	.11	.42
	4	.005	27.977	.98	.03	.61	.56

a. Dependent Variable: AgeDiagBCSclero

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	35.76	54.59	47.53	3.639	99
Std. Predicted Value	-3.261	1.927	-.018	1.002	99
Standard Error of Predicted Value	1.164	3.935	2.117	.592	99
Adjusted Predicted Value	34.52	54.46	47.50	3.761	94
Residual	-26.178	19.897	-.596	10.274	94
Std. Residual	-2.451	1.863	-.056	.962	94
Stud. Residual	-2.487	1.897	-.059	.983	94
Deleted Residual	-26.943	20.631	-.664	10.724	94
Stud. Deleted Residual	-2.561	1.925	-.062	.992	94
Mahal. Distance	.127	11.768	2.989	2.352	99

Cook's Distance	.000	.119	.011	.017	94
Centered Leverage Value	.001	.125	.032	.025	99

a. Dependent Variable: AgeDiagBCSclero

Multiple Regression Analysis: Split File - Scleroderma and Breast Cancer – Age Diagnosed - Psychosocial Variables

Descriptive Statistics

BreastCancerScleroderma		Mean	Std. Deviation	N
.BreastCancer	AgeDiagBCSclero	50.35	8.637	23
	Hyperarousal	74.9091	15.35581	22
	Self Compassion	81.0909	14.88019	22
	Transformed SQRT Stress	3.4289	.45433	22
Scleroderma	AgeDiagBCSclero	46.90	11.600	91
	Hyperarousal	73.6410	15.92513	78
	Self Compassion	83.1500	17.94725	80
	Transformed SQRT Stress	3.4489	.52086	92

Correlations

BreastCancerScleroderma			AgeDiagBCSclero	Hyperarousal	Self Compassion	Transformed SQRT Stress
.BreastCancer	Pearson Correlation	AgeDiagBCSclero	1.000	-.121	.603	-.424
		Hyperarousal	-.121	1.000	-.492	.609
		Self Compassion	.603	-.492	1.000	-.557
		Transformed SQRT Stress	-.424	.609	-.557	1.000
	Sig. (1-tailed)	AgeDiagBCSclero	.	.301	.002	.028
		Hyperarousal	.301	.	.010	.001
		Self Compassion	.002	.010	.	.004
		Transformed SQRT Stress	.028	.001	.004	.
	N	AgeDiagBCSclero	23	21	21	21
		Hyperarousal	21	22	22	22
		Self Compassion	21	22	22	22
		Transformed SQRT Stress	21	22	22	22
Scleroderma	Pearson Correlation	AgeDiagBCSclero	1.000	-.346	.163	-.225
		Hyperarousal	-.346	1.000	-.425	.500
		Self Compassion	.163	-.425	1.000	-.439
		Transformed SQRT Stress	-.225	.500	-.439	1.000
	Sig. (1-tailed)	AgeDiagBCSclero	.	.001	.080	.017
		Hyperarousal	.001	.	.000	.000
		Self Compassion	.080	.000	.	.000
		Transformed SQRT Stress	.017	.000	.000	.

N	AgeDiagBCSclero	91	74	76	88
	Hyperarousal	74	78	77	77
	Self Compassion	76	77	80	80
	Transformed SQRT Stress	88	77	80	92

Variables Entered/Removed[a]

BreastCancer Scleroderma	Model	Variables Entered	Variables Removed	Method
BreastCancer	1	Transformed SQRT Stress, Self Compassion, Hyperarousal[b]	.	Enter
Scleroderma	2	Transformed SQRT Stress, Self Compassion, Hyperarousal[b]	.	Enter

a. Dependent Variable: AgeDiagBCSclero

b. All requested variables entered.

Model Summary[b]

BreastCancer Scleroderma	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
BreastCancer	1	.674[a]	.454	.358	6.922
Scleroderma	2	.352[a]	.124	.086	11.089

a. Predictors: (Constant), Transformed SQRT Stress, Self Compassion, Hyperarousal

b. Dependent Variable: AgeDiagBCSclero

ANOVA[a]

BreastCancer Scleroderma	Model		Sum of Squares	df	Mean Square	F	Sig.
BreastCancer	1	Regression	677.500	3	225.833	4.713	.014[b]
		Residual	814.515	17	47.913		
		Total	1492.016	20			
Scleroderma	2	Regression	1214.670	3	404.890	3.293	.025[b]
		Residual	8607.975	70	122.971		
		Total	9822.645	73			

a. Dependent Variable: AgeDiagBCSclero

b. Predictors: (Constant), Transformed SQRT Stress, Self Compassion, Hyperarousal

Coefficients[a]

Breast Cancer Sclero derma	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinea
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance
Breast Cancer	1	(Constant)	26.004	22.043		1.180	.254	-20.503	72.511				
		Hyperarousal	.206	.131	.366	1.577	.133	-.070	.481	-.121	.357	.283	
		Self Compassion	.355	.129	.612	2.761	.013	.084	.627	.603	.556	.495	
		Transformed SQRT Stress	-5.805	4.628	-.305	-1.254	.227	-15.570	3.960	-.424	-.291	-.225	
Sclero derma	2	(Constant)	68.984	14.812		4.657	.000	39.442	98.526				
		Hyperarousal	-.227	.098	-.312	-2.327	.023	-.422	-.032	-.346	-.268	-.260	
		Self Compassion	.000	.083	.000	-.002	.998	-.167	.166	.163	.000	.000	
		Transformed SQRT Stress	-1.549	3.006	-.070	-.515	.608	-7.544	4.445	-.225	-.061	-.058	

a. Dependent Variable: AgeDiagBCSclero

Collinearity Diagnostics[a]

BreastCancer Scleroderma	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
					(Constant)	Hyperarousal	Self Compassion	Transformed SQRT Stress
BreastCancer	1	1	3.928	1.000	.00	.00	.00	.00
		2	.057	8.276	.00	.13	.20	.01
		3	.011	18.779	.03	.86	.14	.35
		4	.003	34.934	.97	.00	.65	.64
Scleroderma	2	1	3.909	1.000	.00	.00	.00	.00
		2	.069	7.516	.00	.14	.29	.02
		3	.016	15.406	.02	.82	.11	.43
		4	.005	26.931	.98	.04	.60	.55

a. Dependent Variable: AgeDiagBCSclero

Residuals Statistics[a]

BreastCancerScleroderma		Minimum	Maximum	Mean	Std. Deviation	N
BreastCancer	Predicted Value	40.55	60.62	50.35	5.820	22
	Std. Predicted Value	-1.683	1.765	.000	1.000	22
	Standard Error of Predicted Value	2.079	4.194	2.971	.572	22
	Adjusted Predicted Value	40.35	60.58	50.12	5.986	21
	Residual	-10.812	18.357	.143	6.769	21
	Std. Residual	-1.562	2.652	.021	.978	21

	Stud. Residual	-1.721	2.794	.025	1.058	21
	Deleted Residual	-13.123	20.372	.214	7.936	21
	Stud. Deleted Residual	-1.837	3.685	.056	1.203	21
	Mahal. Distance	.852	6.388	2.864	1.465	22
	Cook's Distance	.000	.214	.047	.062	21
	Centered Leverage Value	.043	.319	.143	.073	22
	Predicted Value	34.34	54.59	46.82	4.089	77
	Std. Predicted Value	-3.079	1.885	-.019	1.002	77
	Standard Error of Predicted Value	1.367	4.506	2.491	.716	77
	Adjusted Predicted Value	32.43	56.03	46.80	4.291	73
	Residual	-25.739	17.400	-.865	10.535	73
Scleroderma	Std. Residual	-2.321	1.569	-.078	.950	73
	Stud. Residual	-2.361	1.607	-.082	.977	73
	Deleted Residual	-26.641	18.254	-.963	11.144	73
	Stud. Deleted Residual	-2.444	1.626	-.087	.987	73
	Mahal. Distance	.123	11.069	2.997	2.377	77
	Cook's Distance	.000	.162	.014	.022	73
	Centered Leverage Value	.002	.152	.041	.033	77

a. Dependent Variable: AgeDiagBCSclero

Multiple Regression Analysis: Scleroderma/Breast Cancer - Differences in Predictor Variables-Self-Compassion

Descriptive Statistics

BreastCancerScleroderma		Mean	Std. Deviation	N
BreastCancer	Self Compassion	81.0909	14.88019	22
	Hyperarousal	74.9091	15.35581	22
	Total EMWS	71.9091	27.12038	22
Scleroderma	Self Compassion	83.1500	17.94725	80
	Hyperarousal	73.6410	15.92513	78
	Total EMWS	70.0284	23.94298	88

Correlations

BreasCancerScleroderma			Self Compassion	Hyperarousal	Total EMWS
		Self Compassion	1.000	-.492	.264
	Pearson Correlation	Hyperarousal	-.492	1.000	-.058
		Total EMWS	.264	-.058	1.000
.		Self Compassion	.	.010	.118
	Sig. (1-tailed)	Hyperarousal	.010	.	.400
		Total EMWS	.118	.400	.
BreastCancer		Self Compassion	22	22	22
	N	Hyperarousal	22	22	22
		Total EMWS	22	22	22
		Self Compassion	1.000	-.425	.340
	Pearson Correlation	Hyperarousal	-.425	1.000	-.312
		Total EMWS	.340	-.312	1.000
		Self Compassion	.	.000	.001
Scleroderma	Sig. (1-tailed)	Hyperarousal	.000	.	.003
		Total EMWS	.001	.003	.
		Self Compassion	80	77	78
	N	Hyperarousal	77	78	76
		Total EMWS	78	76	88

Variables Entered/Removed[a]

BreastCancerScleroderma	Model	Variables Entered	Variables Removed	Method
BreastCancer	1	Total EMWS, Hyperarousal[b]	.	Enter
Scleroderma	2	Total EMWS, Hyperarousal[b]	.	Enter

a. Dependent Variable: Self Compassion b. All requested variables entered.

Model Summary[b]

BreastCancerScleroderma	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
BreastCancer.	1	.545[a]	.297	.223	13.11445
Scleroderma	2	.478[a]	.228	.207	15.98074

a. Predictors: (Constant), Total EMWS, Hyperarousal b. Dependent Variable: Self Compassion

ANOVA[a]

BreastCancerScleroderma	Model		Sum of Squares	df	Mean Square	F	Sig.
BreastCancer	1	Regression	1382.032	2	691.016	4.018	.035[b]
		Residual	3267.786	19	171.989		
		Total	4649.818	21			
Scleroderma	2	Regression	5514.738	2	2757.369	10.797	.000[b]
		Residual	18643.047	73	255.384		
		Total	24157.785	75			

a. Dependent Variable: Self Compassion

c. Predictors: (Constant), Total EMWS, Hyperarousal

Coefficients[a]

BreastCancer Scleroderma	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collin
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Toleran
BreastCancer.	1	(Constant)	106.472	16.534		6.440	.000	71.866	141.077				
		Hyperarousal	-.463	.187	-.478	-2.481	.023	-.854	-.072	-.492	-.495	-.477	
		Total EMWS	.130	.106	.236	1.226	.235	-.092	.351	.264	.271	.236	
Scleroderma	2	(Constant)	100.444	12.173		8.251	.000	76.182	124.705				
		Hyperarousal	-.398	.122	-.354	-3.266	.002	-.641	-.155	-.425	-.357	-.336	
		Total EMWS	.172	.081	.229	2.120	.037	.010	.334	.340	.241	.218	

a. Dependent Variable: Self Compassion

Collinearity Diagnostics[a]

BreastCancer Scleroderma	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
					(Constant)	Hyperarousal	Total EMWS
BreastCancer	1	1	2.890	1.000	.00	.00	.01
		2	.093	5.588	.02	.11	.84
		3	.017	12.973	.97	.88	.14
Scleroderma	2	1	2.886	1.000	.00	.00	.01
		2	.099	5.396	.01	.14	.58
		3	.014	14.163	.99	.85	.41

a. Dependent Variable: Self Compassion

Residuals Statistics[a]

BreastCancerScleroderma		Minimum	Maximum	Mean	Std. Deviation	N
BreastCancer	Predicted Value	69.6172	95.5846	81.0909	8.11240	22
	Std. Predicted Value	-1.414	1.787	.000	1.000	22

	Standard Error of Predicted Value	3.151	6.382	4.746	.986	22
	Adjusted Predicted Value	70.9355	99.1591	81.5163	8.17858	22
	Residual	-23.90904	26.34596	.00000	12.47433	22
	Std. Residual	-1.823	2.009	.000	.951	22
	Stud. Residual	-1.929	2.072	-.015	1.013	22
	Deleted Residual	-26.75850	28.02523	-.42541	14.17540	22
	Stud. Deleted Residual	-2.093	2.292	-.018	1.063	22
	Mahal. Distance	.258	4.019	1.909	1.137	22
	Cook's Distance	.000	.267	.046	.066	22
	Centered Leverage Value	.012	.191	.091	.054	22
Scleroderma	Predicted Value	55.6232	100.8019	82.9936	8.65402	76
	Std. Predicted Value	-3.210	2.059	-.018	1.009	76
	Standard Error of Predicted Value	1.864	6.243	3.096	.790	76
	Adjusted Predicted Value	58.7977	101.0118	82.9608	8.65818	76
	Residual	-42.95408	44.46497	-.16465	15.79726	76
	Std. Residual	-2.688	2.782	-.010	.989	76
	Stud. Residual	-2.716	2.905	-.009	1.012	76
	Deleted Residual	-43.87169	48.48402	-.13189	16.56391	76
	Stud. Deleted Residual	-2.845	3.068	-.008	1.032	76
	Mahal. Distance	.033	10.461	2.010	1.663	76
	Cook's Distance	.000	.254	.017	.039	76
	Centered Leverage Value	.000	.139	.027	.022	76

a. Dependent Variable: Self Compassion

Multiple Regression Analysis: Scleroderma Predictor Variables for Hyper-arousal – Self-Compassion/Age Diagnosed Scleroderma

Descriptive Statistics

Scleroderma		Mean	Std. Deviation	N
.	Hyperarousal	72.3924	14.24998	79
	Self Compassion	84.9625	15.69362	80
	Total EMWS	76.8810	22.25558	84
	AgeDiagBCSclero	50.35	8.637	23
1.00	Hyperarousal	73.6410	15.92513	78
	Self Compassion	83.1500	17.94725	80
	Total EMWS	70.0284	23.94298	88
	AgeDiagBCSclero	46.90	11.600	91

Correlations

Scleroderma			Hyperarousal	Self Compassion	Total EMWS	AgeDiagBCSclero
.	Pearson Correlation	Hyperarousal	1.000	-.605	-.383	-.121
		Self Compassion	-.605	1.000	.432	.603
		Total EMWS	-.383	.432	1.000	-.228
		AgeDiagBCSclero	-.121	.603	-.228	1.000
	Sig. (1-tailed)	Hyperarousal	.	.000	.000	.301
		Self Compassion	.000	.	.000	.002
		Total EMWS	.000	.000	.	.160
		AgeDiagBCSclero	.301	.002	.160	.
	N	Hyperarousal	79	79	78	21
		Self Compassion	79	80	79	21
		Total EMWS	78	79	84	21
		AgeDiagBCSclero	21	21	21	23
1.00	Pearson Correlation	Hyperarousal	1.000	-.425	-.312	-.346
		Self Compassion	-.425	1.000	.340	.163
		Total EMWS	-.312	.340	1.000	-.023
		AgeDiagBCSclero	-.346	.163	-.023	1.000
	Sig. (1-tailed)	Hyperarousal	.	.000	.003	.001
		Self Compassion	.000	.	.001	.080
		Total EMWS	.003	.001	.	.418
		AgeDiagBCSclero	.001	.080	.418	.
	N	Hyperarousal	78	77	76	74
		Self Compassion	77	80	78	76
		Total EMWS	76	78	88	84
		AgeDiagBCSclero	74	76	84	91

Model Summary[b]

Scleroderma	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
						R Square Change	F Change	df1	df2	Sig. F Change
.	1	.685[a]	.469	.375	11.26709	.469	4.997	3	17	.012
1.00	1	.549[a]	.301	.271	13.59802	.301	10.041	3	70	.000

a. Predictors: (Constant), AgeDiagBCSclero, Total EMWS, Self Compassion

b. Dependent Variable: Hyperarousal

Variables Entered/Removed[a]

Scleroderma	Model	Variables Entered	Variables Removed	Method
.	1	AgeDiagBCSclero, Total EMWS, Self Compassion[b]	.	Enter
1.00	1	AgeDiagBCSclero, Total EMWS, Self Compassion[b]	.	Enter

a. Dependent Variable: Hyperarousal

b. All requested variables entered.

ANOVA[a]

Scleroderma	Model		Sum of Squares	df	Mean Square	F	Sig.
.	1	Regression	1903.136	3	634.379	4.997	.012[b]
		Residual	2158.104	17	126.947		
		Total	4061.240	20			
1.00	1	Regression	5570.079	3	1856.693	10.041	.000[b]
		Residual	12943.431	70	184.906		
		Total	18513.510	73			

a. Dependent Variable: Hyperarousal

b. Predictors: (Constant), AgeDiagBCSclero, Total EMWS, Self Compassion

Coefficients[a]

Scleroderma	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
			B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
.	1	(Constant)	98.494	19.892		4.951	.000	56.525	140.463			
		Self Compassion	-.880	.296	-.969	-2.973	.009	-1.504	-.255	-.605	-.585	-.526
		Total EMWS	.096	.171	.149	.559	.583	-.265	.457	-.383	.134	.099
		AgeDiagBCSclero	.820	.498	.497	1.646	.118	-.231	1.871	-.121	.371	.291
1.00	1	(Constant)	125.493	9.619		13.046	.000	106.307	144.678			
		Self Compassion	-.268	.096	-.302	-2.798	.007	-.460	-.077	-.425	-.317	-.280
		Total EMWS	-.144	.071	-.216	-2.030	.046	-.285	-.003	-.312	-.236	-.203
		AgeDiagBCSclero	-.415	.140	-.302	-2.973	.004	-.693	-.137	-.346	-.335	-.297

a. Dependent Variable: Hyperarousal

Collinearity Diagnostics[a]

Scleroderma	Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
					(Constant)	Self Compassion	Total EMWS	AgeDiagBCScler o
.	1	1	3.914	1.000	.00	.00	.00	.00
		2	.065	7.731	.01	.00	.33	.04
		3	.016	15.577	.57	.22	.00	.01
		4	.004	30.247	.42	.78	.67	.94
1.00	1	1	3.860	1.000	.00	.00	.01	.00
		2	.086	6.716	.01	.00	.67	.21
		3	.035	10.501	.02	.56	.31	.51
		4	.019	14.212	.96	.43	.02	.27

a. Dependent Variable: Hyperarousal

Study 3(b) Kruskal-Wallis Test: Scleroderma/Breast Cancer/Community

Psychosocial Variables (includes Depression and Anxiety)

Ranks

	ScleroBCCom	N	Mean Rank
Self Compassion Self Kindness	Community	58	93.21
	Scleroderma	81	72.30
	Breast Cancer	22	80.86
	Total	161	
Self Compassion Over Identification	Community	58	67.74
	Scleroderma	80	94.18
	Breast Cancer	22	64.39
	Total	160	
Self Compassion Mindfulness	Community	58	92.66
	Scleroderma	81	73.91
	Breast Cancer	22	76.36
	Total	161	
Stress DASS	Community	63	85.44
	Scleroderma	92	91.11
	Breast Cancer	22	90.36
	Total	177	
Anxiety DASS	Community	63	65.72
	Scleroderma	93	104.66
	Breast Cancer	22	93.50
	Total	178	
Depression DASS	Community	63	73.86
	Scleroderma	92	97.86
	Breast Cancer	22	95.32

Total EMWS	Total	177	
	Community	62	97.29
	Scleroderma	88	79.19
	Breast Cancer	22	85.32
RQ Insecure Dismissive	Total	172	
	Community	63	88.75
	Scleroderma	87	86.11
	Breast Cancer	22	81.59
RQ Insecure Fear	Total	172	
	Community	63	87.33
	Scleroderma	86	79.47
	Breast Cancer	22	107.73
ERQ Reappraisal	Total	171	
	Community	58	88.90
	Scleroderma	81	75.83
	Breast Cancer	22	79.23
ERQ Suppresion	Total	161	
	Community	58	76.08
	Scleroderma	81	83.58
	Breast Cancer	22	84.48
Hyperarousal	Total	161	
	Community	57	74.78
	Scleroderma	78	80.28
	Breast Cancer	22	85.39
Hyperarousal Introspect	Total	157	
	Community	58	79.66
	Scleroderma	80	78.83
	Breast Cancer	22	88.80
Hyperarousal Reactive	Total	160	
	Community	58	72.33
	Scleroderma	81	84.57
	Breast Cancer	22	90.70
Self Compassion	Total	161	
	Community	58	86.85
	Scleroderma	80	78.37
	Breast Cancer	22	71.50
Self Compassion Self Judgement	Total	160	
	Community	58	82.41
	Scleroderma	81	80.22
	Breast Cancer	22	80.18
Self Compassion Common Humanity	Total	161	
	Community	58	85.30
	Scleroderma	81	77.25
	Breast Cancer	22	83.45

	Total	161	
Self Compassion Isolation	Community	58	87.07
	Scleroderma	81	79.30
	Breast Cancer	22	71.27
	Total	161	

Test Statistics[a,b]

	Self Compassion Self Kindness	Self Compassion Over Identification	Total DASS	Anxiety DASS	Depression DASS	Total EMWS	RQ Insecure Fear
Chi-Square	6.836	14.147	9.535	22.159	8.770	4.821	5.830
df	2	2	2	2	2	2	2
Asymp. Sig.	.033	.001	.009	.000	.012	.090	.054

a. Kruskal Wallis Test

b. Grouping Variable: ScleroBCCom

Report

ScleroBCCom		Anxiety DASS	Depression DASS	Total EMWS	RQ Insecure Fear	Self Compassion Over Identification	Self Compassion Self Kindness
Community	N	63	63	62	62	58	58
	Median	8.0000	8.0000	82.0000	9.0000	13.0000	15.0000
Scleroderma	N	93	92	88	86	80	81
	Median	10.0000	10.0000	71.5000	9.0000	16.0000	14.0000
Breast Cancer	N	22	22	22	22	22	22
	Median	9.5000	10.0000	80.0000	12.0000	13.0000	15.0000
Total	N	178	177	172	170	160	161
	Median	9.0000	9.0000	76.0000	9.0000	15.0000	14.0000

Kruskal-Wallis Test: Diffuse/ Limited Sclerosis, Breast Cancer and Community Groups

Comparison - Psychosocial Variables

Ranks

	No Sclero Dif Lim	N	Mean Rank
Total DASS	No Sclero	63	68.90
	Diffuse Sclero	33	93.92
	Limited Sclero	49	92.90
	Breast Cancer	22	92.52
	Total	167	
Stress DASS	No Sclero	63	81.52
	Diffuse Sclero	34	82.21
	Limited Sclero	49	89.22
	Breast Cancer	22	86.05
	Total	168	

	No Sclero	63	62.75
	Diffuse Sclero	34	106.38
Anxiety DASS	Limited Sclero	50	96.68
	Breast Cancer	22	89.14
	Total	169	
	No Sclero	63	70.33
	Diffuse Sclero	33	89.83
Depression DASS	Limited Sclero	50	96.13
	Breast Cancer	22	90.64
	Total	168	
	No Sclero	58	64.96
	Diffuse Sclero	31	95.02
Self Compassion Over Identification	Limited Sclero	42	88.36
	Breast Cancer	22	61.68
	Total	153	
	No Sclero	58	88.59
	Diffuse Sclero	31	85.05
Self Compassion Self Kindness	Limited Sclero	43	57.41
	Breast Cancer	22	76.89
	Total	154	
	No Sclero	58	87.17
	Diffuse Sclero	31	87.48
Self Compassion Mindfulness	Limited Sclero	43	60.35
	Breast Cancer	22	71.45
	Total	154	

Test Statistics[a,b]

	Total DASS	Stress DASS	Anxiety DASS	Depression DASS	Self Compassion Over Identification	Self Compassion Self Kindness	Self Compassion Mindfulness
Chi-Square	9.896	.805	23.120	9.136	14.918	13.277	11.148
df	3	3	3	3	3	3	3
Asymp. Sig.	.019	.848	.000	.028	.002	.004	.011

a. Kruskal Wallis Test

b. Grouping Variable: No Sclero Dif Lim

Report

No Sclero Dif Lim		Anxiety DASS	Depression DASS	Total EMWS	Self Compassion Over Identification	Self Compassion Self Kindness	Self Compassion Mindfulness
No Sclero	N	63	63	62	58	58	58
	Median	8.0000	8.0000	82.0000	13.0000	15.0000	14.0000
Diffuse Sclero	N	34	33	32	31	31	31
	Median	10.5000	10.0000	71.5000	16.0000	16.0000	13.0000
Limited Sclero	N	50	50	47	42	43	43

	Median	10.0000	10.5000	72.0000	15.5000	13.0000	12.0000
Breast Cancer	N	22	22	22	22	22	22
	Median	9.5000	10.0000	80.0000	13.0000	15.0000	13.5000
Total	N	169	168	163	153	154	154
	Median	9.0000	9.0000	76.0000	15.0000	14.0000	13.0000

Mann Witney U-Test: Scleroderma/Breast Cancer — Scleroderma/Community – Breast Cancer/Community (not significant and not presented) Groups

Comparison - Psychosocial Variables – Scleroderma and Breast Cancer Groups

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
RQ Insecure Fear	Scleroderma	86	51.08	4393.00
	Breast Cancer	22	67.86	1493.00
	Total	108		
Self Compassion Over Identification	Scleroderma	80	55.46	4437.00
	Breast Cancer	22	37.09	816.00
	Total	102		
Stress DASS	Scleroderma	92	57.51	5291.00
	Breast Cancer	22	57.45	1264.00
	Total	114		
Anxiety DASS	Scleroderma	93	59.63	5546.00
	Breast Cancer	22	51.09	1124.00
	Total	115		
Depression DASS	Scleroderma	92	57.74	5312.00
	Breast Cancer	22	56.50	1243.00
	Total	114		
Total EMWS	Scleroderma	88	54.90	4831.50
	Breast Cancer	22	57.89	1273.50
	Total	110		
RQ Insecure Dismissive	Scleroderma	87	55.53	4831.00
	Breast Cancer	22	52.91	1164.00
	Total	109		
ERQ Reappraisal	Scleroderma	81	51.53	4174.00
	Breast Cancer	22	53.73	1182.00

	Total	103		
	Scleroderma	81	52.00	4212.00
ERQ Suppresion	Breast Cancer	22	52.00	1144.00
	Total	103		
	Scleroderma	78	49.72	3878.00
Hyperarousal	Breast Cancer	22	53.27	1172.00
	Total	100		
	Scleroderma	81	51.15	4143.50
Hyperarousal Reactive	Breast Cancer	22	55.11	1212.50
	Total	103		
	Scleroderma	80	52.46	4197.00
Self Compassion	Breast Cancer	22	48.00	1056.00
	Total	102		
	Scleroderma	81	51.96	4209.00
Self Compassion Self Judgement	Breast Cancer	22	52.14	1147.00
	Total	103		
	Scleroderma	81	53.10	4301.00
Self Compassion Isolation	Breast Cancer	22	47.95	1055.00
	Total	103		
	Scleroderma	81	50.77	4112.00
Self Compassion Self Kindness	Breast Cancer	22	56.55	1244.00
	Total	103		
	Scleroderma	81	50.95	4127.00
Self Compassion Common Humanity	Breast Cancer	22	55.86	1229.00
	Total	103		
	Scleroderma	81	51.46	4168.50
Self Compassion Mindfulness	Breast Cancer	22	53.98	1187.50
	Total	103		

Mann Witney U Test: Scleroderma/BC - Fearful Attachment and Over-identification (only significant variables)

Test Statistics[a]

	RQ Insecure Fear	Self Compassion Over Identification	Anxiety DASS	Depression DASS	Total EMWS
Mann-Whitney U	652.000	563.000	871.000	990.000	915.500
Wilcoxon W	4393.000	816.000	1124.000	1243.000	4831.500
Z	-2.251	-2.592	-1.089	-.159	-.392
Asymp. Sig. (2-tailed)	.024	.010	.276	.873	.695

a. Grouping Variable: ScleroBCCom

Report

BCScleroComm		Self Compassion Over Identification	RQ Insecure Fear
1	N	58	62
	Median	13.0000	9.0000
Scleroderma	N	80	86
	Median	16.0000	9.0000
Breast Cancer	N	22	22
	Median	13.0000	12.0000
Total	N	160	170
	Median	15.0000	9.0000

Mann-Whitney U– Scleroderma and Community Groups - Psychosocial Variables

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
Self Compassion Over Identification	Community	58	56.09	3253.50
	Scleroderma	80	79.22	6337.50
	Total	138		
Depression DASS	Community	63	65.41	4121.00
	Scleroderma	92	86.62	7969.00
	Total	155		
Total EMWS	Community	62	85.02	5271.50
	Scleroderma	88	68.79	6053.50
	Total	150		
Total DASS	Community	63	64.88	4087.50
	Scleroderma	91	86.24	7847.50
	Total	154		
Anxiety DASS	Community	63	58.53	3687.50
	Scleroderma	93	92.03	8558.50
	Total	156		
Self Compassion Self Kindness	Community	58	80.43	4665.00
	Scleroderma	81	62.53	5065.00
	Total	139		
Self Compassion Mindfulness	Community	58	79.16	4591.00
	Scleroderma	81	63.44	5139.00
	Total	139		

Test Statistics[a]

	Self Compassion Over Identification	Depression DASS	Total EMWS	Total DASS	Anxiety DASS	Self Compassion Self Kindness	Self Compassion Mindfulness

Mann-Whitney U	1542.500	2105.000	2137.500	2071.500	1671.500	1744.000	1818.000
Wilcoxon W	3253.500	4121.000	6053.500	4087.500	3687.500	5065.000	5139.000
Z	-3.367	-2.921	-2.254	-2.925	-4.604	-2.591	-2.279
Asymp. Sig. (2-tailed)	.001	.003	.024	.003	.000	.010	.023

a. Grouping Variable: ScleroBCCom

Report

SclerodNoYs		Total EMWS	Self Compassion Over Identification	Self Compassion Self Kindness	Self Compassion Mindfulness	Anxiety DASS	Depression DASS
1	N	62	58	58	58	63	63
	Median	82.0000	13.0000	15.0000	14.0000	8.0000	8.0000
2	N	88	80	81	81	93	92
	Median	71.5000	16.0000	14.0000	12.0000	10.0000	10.0000
Total	N	150	138	139	139	156	155
	Median	75.5000	15.0000	14.0000	13.0000	9.0000	9.0000

Frequencies: Scleroderma, Breast Cancer and Community Groups

Total Illness (BC/Scleroderma) - Depression, Anxiety and Stress

Stress DASS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	9	5.9	7.9	7.9
	8.00	9	5.9	7.9	15.8
	9.00	11	7.2	9.6	25.4
	10.00	14	9.2	12.3	37.7
	11.00	15	9.8	13.2	50.9
	12.00	11	7.2	9.6	60.5
	13.00	11	7.2	9.6	70.2
	14.00	7	4.6	6.1	76.3
	15.00	5	3.3	4.4	80.7
	16.00	7	4.6	6.1	86.8
	17.00	2	1.3	1.8	88.6
	18.00	4	2.6	3.5	92.1
	19.00	5	3.3	4.4	96.5
	20.00	2	1.3	1.8	98.2
	21.00	2	1.3	1.8	100.0
	Total	114	74.5	100.0	
Missing	System	39	25.5		
Total		153	100.0		

Anxiety DASS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	22	14.4	19.1	19.1
	8.00	11	7.2	9.6	28.7
	9.00	16	10.5	13.9	42.6
	10.00	15	9.8	13.0	55.7
	11.00	7	4.6	6.1	61.7
	12.00	12	7.8	10.4	72.2
	13.00	11	7.2	9.6	81.7
	14.00	5	3.3	4.3	86.1
	15.00	6	3.9	5.2	91.3
	16.00	2	1.3	1.7	93.0
	17.00	2	1.3	1.7	94.8
	18.00	2	1.3	1.7	96.5
	19.00	3	2.0	2.6	99.1
	22.00	1	.7	.9	100.0
	Total	115	75.2	100.0	
Missing	System	38	24.8		
Total		153	100.0		

Depression DASS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	14	9.2	12.3	12.3
	8.00	26	17.0	22.8	35.1
	9.00	11	7.2	9.6	44.7
	10.00	8	5.2	7.0	51.8
	11.00	11	7.2	9.6	61.4
	12.00	9	5.9	7.9	69.3
	13.00	9	5.9	7.9	77.2
	14.00	5	3.3	4.4	81.6
	15.00	3	2.0	2.6	84.2
	16.00	2	1.3	1.8	86.0
	17.00	3	2.0	2.6	88.6
	18.00	2	1.3	1.8	90.4
	21.00	3	2.0	2.6	93.0
	23.00	1	.7	.9	93.9
	24.00	3	2.0	2.6	96.5

	25.00	2	1.3	1.8	98.2
	26.00	1	.7	.9	99.1
	27.00	1	.7	.9	100.0
	Total	114	74.5	100.0	
Missing	System	39	25.5		
Total		153	100.0		

Frequencies: Scleroderma, Breast Cancer and Community Groups

Scleroderma - Depression, Anxiety and Stress

Depression DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	10	8.2	10.9	10.9
	8.00	22	18.0	23.9	34.8
	9.00	8	6.6	8.7	43.5
	10.00	8	6.6	8.7	52.2
	11.00	9	7.4	9.8	62.0
	12.00	7	5.7	7.6	69.6
	13.00	7	5.7	7.6	77.2
	14.00	4	3.3	4.3	81.5
	15.00	3	2.5	3.3	84.8
	16.00	2	1.6	2.2	87.0
	17.00	3	2.5	3.3	90.2
	18.00	1	.8	1.1	91.3
	21.00	2	1.6	2.2	93.5
	24.00	3	2.5	3.3	96.7
	25.00	1	.8	1.1	97.8
	26.00	1	.8	1.1	98.9
	27.00	1	.8	1.1	100.0
	Total	92	75.4	100.0	
Missing	System	30	24.6		
Total		122	100.0		

a. BCScleroComm = Scleroderma

Anxiety DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
	7.00	17	13.9	18.3	18.3
	8.00	10	8.2	10.8	29.0
	9.00	11	9.0	11.8	40.9
	10.00	13	10.7	14.0	54.8
	11.00	4	3.3	4.3	59.1
	12.00	9	7.4	9.7	68.8
	13.00	9	7.4	9.7	78.5
Valid	14.00	5	4.1	5.4	83.9
	15.00	5	4.1	5.4	89.2
	16.00	2	1.6	2.2	91.4
	17.00	2	1.6	2.2	93.5
	18.00	2	1.6	2.2	95.7
	19.00	3	2.5	3.2	98.9
	22.00	1	.8	1.1	100.0
	Total	93	76.2	100.0	
Missing	System	29	23.8		
Total		122	100.0		

a. BCScleroComm = Scleroderma

Stress DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
	7.00	7	5.7	7.6	7.6
	8.00	8	6.6	8.7	16.3
	9.00	11	9.0	12.0	28.3
	10.00	10	8.2	10.9	39.1
	11.00	10	8.2	10.9	50.0
	12.00	9	7.4	9.8	59.8
	13.00	8	6.6	8.7	68.5
	14.00	6	4.9	6.5	75.0
Valid	15.00	4	3.3	4.3	79.3
	16.00	7	5.7	7.6	87.0
	17.00	1	.8	1.1	88.0
	18.00	3	2.5	3.3	91.3
	19.00	4	3.3	4.3	95.7
	20.00	2	1.6	2.2	97.8
	21.00	2	1.6	2.2	100.0
	Total	92	75.4	100.0	

Missing	System	30	24.6		
Tota		122	100.0		

Frequencies: Scleroderma, Breast Cancer and Community Groups

Breast Cancer - Depression, Anxiety and Stress

Depression DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	4	14.3	18.2	18.2
	8.00	4	14.3	18.2	36.4
	9.00	3	10.7	13.6	50.0
	11.00	2	7.1	9.1	59.1
	12.00	2	7.1	9.1	68.2
	13.00	2	7.1	9.1	77.3
	14.00	1	3.6	4.5	81.8
	18.00	1	3.6	4.5	86.4
	21.00	1	3.6	4.5	90.9
	23.00	1	3.6	4.5	95.5
	25.00	1	3.6	4.5	100.0
	Total	22	78.6	100.0	
Missing	System	6	21.4		
Total		28	100.0		

Anxiety DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	5	17.9	22.7	22.7
	8.00	1	3.6	4.5	27.3
	9.00	5	17.9	22.7	50.0
	10.00	2	7.1	9.1	59.1
	11.00	3	10.7	13.6	72.7
	12.00	3	10.7	13.6	86.4
	13.00	2	7.1	9.1	95.5
	15.00	1	3.6	4.5	100.0
	Total	22	78.6	100.0	
Missing	System	6	21.4		
Total		28	100.0		

a. BCScleroComm = Breast Cancer

Stress DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	2	7.1	9.1	9.1
	8.00	1	3.6	4.5	13.6
	10.00	4	14.3	18.2	31.8
	11.00	5	17.9	22.7	54.5
	12.00	2	7.1	9.1	63.6
	13.00	3	10.7	13.6	77.3
	14.00	1	3.6	4.5	81.8
	15.00	1	3.6	4.5	86.4
	17.00	1	3.6	4.5	90.9
	18.00	1	3.6	4.5	95.5
	19.00	1	3.6	4.5	100.0
	Total	22	78.6	100.0	
Missing	System	6	21.4		
Total		28	100.0		

a. BCScleroComm = Breast Cancer

Frequencies: Scleroderma, Breast Cancer and Community Groups

Community - *Depression, Anxiety and Stress*

Depression DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	17	27.0	27.0	27.0
	8.00	15	23.8	23.8	50.8
	9.00	7	11.1	11.1	61.9
	10.00	5	7.9	7.9	69.8
	11.00	5	7.9	7.9	77.8
	12.00	4	6.3	6.3	84.1
	13.00	4	6.3	6.3	90.5
	14.00	3	4.8	4.8	95.2
	16.00	2	3.2	3.2	98.4
	17.00	1	1.6	1.6	100.0
	Total	63	100.0	100.0	

a. BCScleroComm = 1

Anxiety DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	23	36.5	36.5	36.5
	8.00	13	20.6	20.6	57.1
	9.00	9	14.3	14.3	71.4
	10.00	10	15.9	15.9	87.3
	11.00	5	7.9	7.9	95.2
	12.00	2	3.2	3.2	98.4
	13.00	1	1.6	1.6	100.0
	Total	63	100.0	100.0	

a. BCScleroComm = 1

Stress DASS[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	6	9.5	9.5	9.5
	8.00	5	7.9	7.9	17.5
	9.00	5	7.9	7.9	25.4
	10.00	5	7.9	7.9	33.3
	11.00	9	14.3	14.3	47.6
	12.00	13	20.6	20.6	68.3
	13.00	7	11.1	11.1	79.4
	14.00	7	11.1	11.1	90.5
	15.00	2	3.2	3.2	93.7
	16.00	1	1.6	1.6	95.2
	17.00	1	1.6	1.6	96.8
	18.00	1	1.6	1.6	98.4
	20.00	1	1.6	1.6	100.0
	Total	63	100.0	100.0	

Mann Witney U-Tests: Scleroderma/BC/Community - Depression, Anxiety and Stress

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
Depression DASS	Scleroderma	92	57.74	5312.00
	Breast Cancer	22	56.50	1243.00
	Total	114		
Anxiety DASS	Scleroderma	93	59.63	5546.00
	Breast Cancer	22	51.09	1124.00
	Total	115		
Stress DASS	Scleroderma	92	57.51	5291.00
	Breast Cancer	22	57.45	1264.00
	Total	114		

Test Statistics[a]

	Depression DASS	Anxiety DASS	Stress DASS
Mann-Whitney U	990.000	871.000	1011.000
Wilcoxon W	1243.000	1124.000	1264.000
Z	-.159	-1.089	-.007
Asymp. Sig. (2-tailed)	.873	.276	.994

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
Depression DASS	Community	63	65.41	4121.00
	Scleroderma	92	86.62	7969.00
	Total	155		
Anxiety DASS	Community	63	58.53	3687.50
	Scleroderma	93	92.03	8558.50
	Total	156		
Stress DASS	Community	63	74.93	4720.50
	Scleroderma	92	80.10	7369.50
	Total	155		

Test Statistics[a]

	Depression DASS	Anxiety DASS	Stress DASS
Mann-Whitney U	2105.000	1671.500	2704.500
Wilcoxon W	4121.000	3687.500	4720.500
Z	-2.921	-4.604	-.708
Asymp. Sig. (2-tailed)	.003	.000	.479

a. Grouping Variable: ScleroBCCom

Mann Whitney U: Community Breast Cancer

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Depression DASS	177	10.8701	4.32882	7.00	27.00
Anxiety DASS	178	9.9944	3.02251	7.00	22.00
ScleroBCCom	213	1.84	.634	1	3

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
Depression DASS	Community	63	40.44	2548.00
	Breast Cancer	22	50.32	1107.00
	Total	85		
Anxiety DASS	Community	63	39.19	2469.00
	Breast Cancer	22	53.91	1186.00
	Total	85		

Test Statistics[a]

	Depression DASS	Anxiety DASS
Mann-Whitney U	532.000	453.000
Wilcoxon W	2548.000	2469.000
Z	-1.640	-2.469
Asymp. Sig. (2-tailed)	.101	.014

a. Grouping Variable: ScleroBCCom

Mann Whitney U: Scleroderma Breast Cancer

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Depression DASS	177	10.8701	4.32882	7.00	27.00
Anxiety DASS	178	9.9944	3.02251	7.00	22.00
ScleroBCCom	213	1.84	.634	1	3

Ranks

	ScleroBCCom	N	Mean Rank	Sum of Ranks
Depression DASS	Scleroderma	92	57.74	5312.00
	Breast Cancer	22	56.50	1243.00
	Total	114		
Anxiety DASS	Scleroderma	93	59.63	5546.00
	Breast Cancer	22	51.09	1124.00
	Total	115		

Test Statistics[a]

	Depression DASS	Anxiety DASS
Mann-Whitney U	990.000	871.000
Wilcoxon W	1243.000	1124.000
Z	-.159	-1.089
Asymp. Sig. (2-tailed)	.873	.276

a. Grouping Variable: ScleroBCCom

Report

ScleroBCCom		Depression DASS	Anxiety DASS	Stress DASS	Total EMWS
Community	Mean	9.4921	8.5397	11.4603	78.6452
	N	63	63	63	62
	Std. Deviation	2.63275	1.58445	2.78142	20.21531
	Median	8.0000	8.0000	12.0000	82.0000
Scleroderma	Mean	11.5870	11.0000	12.1630	70.0284
	N	92	93	92	88
	Std. Deviation	4.77667	3.49223	3.70410	23.94298
	Median	10.0000	10.0000	11.5000	71.5000
Breast Cancer	Mean	11.8182	9.9091	11.9545	71.9091
	N	22	22	22	22
	Std. Deviation	5.36866	2.30753	3.18445	27.12038
	Median	10.0000	9.5000	11.0000	80.0000
Total	Mean	10.8701	9.9944	11.8870	73.3750
	N	177	178	177	172
	Std. Deviation	4.32882	3.02251	3.33690	23.32118
	Median	9.0000	9.0000	12.0000	76.0000

Correlations

Scleroderma		ScleroHAQ Transformed Sqrt	PAIN	Raynaud	Transformed SQRT Breathing 1SHAQ	Transformed SQRT1 Intestinal SHAQ	Transformed Reflect Log Age Diag Scleroderma	AgeDiagRaynds	Total EMWS 1	Total Dismissive RQ!	Transformed Log Fear RQ	Transform Inverse Depression DASS 1	Transformed Log Anxiety	Transformed Logarithm Stress DASS 1	Transformed Sqrt Self Compassion	Self Kindness Transformed Log	SC Overidentification	SC Isolation	SC Self Judgement	Mindfulness SC	Common Hiumanity SC	Hyperarousal	Hyperarousal Reactive	Transformed Hyperarousal Introspect	Transformed Sqare Root Suppression ERQ1	Reappraisal ERQ1
ScleroHAQ Transformed Sqrt	Pearson Correlation	1	.491**	.252*	.348**	.255*	-.096	.307	-.117	.144	.069	-.190	.263*	.080	-.087	-.195	-.067	-.012	.002	-.052	.015	.008	.272*	-.164	-.023	.001
	Sig. (2-tailed)		.000	.031	.002	.028	.421	.064	.328	.227	.567	.103	.023	.497	.502	.111	.587	.920	.986	.675	.900	.946	.025	.185	.853	.995
	N	75	74	74	75	75	72	37	72	72	72	75	75	74	62	68	68	68	68	68	68	65	68	67	68	68
PAIN	Pearson Correlation	.491**	1	.312**	.346**	.575**	-.146	-.047	-.366**	.281*	.213	-.222	.284*	.190	-.059	-.108	-.038	.070	.107	.060	.083	.084	.281*	-.017	-.204	.100
	Sig. (2-tailed)	.000		.007	.002	.000	.222	.781	.002	.017	.072	.058	.014	.106	.650	.380	.760	.570	.385	.630	.503	.505	.020	.894	.096	.417
	N	74	75	74	75	75	72	38	71	72	72	74	75	74	61	68	68	68	68	68	68	65	68	67	68	68
Raynaud	Pearson Correlation	.252*	.312**	1	.224	.218	.052	-.100	-.168	.146	.198	-.291*	.202	.253*	-.295*	-.354**	.183	.308*	.312**	-.213	-.178	.254*	.361**	.212	.041	-.199
	Sig. (2-tailed)	.031	.007		.054	.060	.666	.555	.162	.221	.095	.012	.082	.030	.021	.003	.135	.011	.010	.082	.148	.041	.003	.085	.741	.104
	N	74	74	75	75	75	72	37	71	72	72	74	75	74	61	68	68	68	68	68	68	65	68	67	68	68
Transformed SQRT Breathing 1SHAQ	Pearson Correlation	.348**	.346**	.224	1	.364**	-.137	.268	-.067	.044	-.060	-.099	.418**	.096	.110	.023	-.201	-.057	-.099	.164	.182	-.059	.073	-.141	-.078	.114
	Sig. (2-tailed)	.002	.002	.054		.001	.246	.104	.577	.709	.616	.399	.000	.413	.396	.854	.098	.640	.420	.179	.134	.637	.550	.251	.527	.350
	N	75	75	75	76	76	73	38	72	73	73	75	76	75	62	69	69	69	69	69	69	66	69	68	69	69
Transformed SQRT1 Intestinal SHAQ	Pearson Correlation	.255*	.575**	.218	.364**	1	.023	.044	-.217	.074	-.004	-.178	.245*	.224	-.016	.019	.005	-.016	.032	.031	.047	.203	.211	.102	-.146	-.018
	Sig. (2-tailed)	.028	.000	.060	.001		.847	.792	.068	.535	.971	.127	.033	.054	.904	.880	.966	.899	.794	.801	.703	.102	.082	.409	.231	.883
	N	75	75	75	76	76	73	38	72	73	73	75	76	75	62	69	69	69	69	69	69	66	69	68	69	69
Transformed Reflect Log Age Diag Scleroderma	Pearson Correlation	-.096	-.146	.052	-.137	.023	1	-.874**	.032	.049	-.048	-.133	.079	.213	-.137	.089	.387**	.249*	.180	-.049	-.023	.368**	.080	.281*	-.090	-.074
	Sig. (2-tailed)	.421	.222	.666	.246	.847		.000	.796	.686	.689	.265	.509	.070	.300	.477	.001	.044	.149	.696	.857	.003	.480	.023	.470	.554
	N	72	72	72	73	73	75	37	70	71	71	72	73	73	59	66	66	66	66	66	66	63	66	65	66	66
AgeDiagRaynds	Pearson Correlation	.307	-.047	-.100	.268	.044	-.874**	1	-.099	-.297	-.171	.208	.140	-.365*	.222	-.150	-.476**	-.405*	-.285	.040	.082	-.298	-.219	-.131	.277	.042
	Sig. (2-tailed)	.064	.781	.555	.104	.792	.000		.566	.074	.312	.217	.401	.026	.239	.354	.003	.014	.092	.817	.635	.082	.200	.446	.102	.809
	N	37	38	37	38	38	37	38	36	37	37	37	38	37	30	36	36	36	36	36	36	35	36	36	36	36
Total EMWS 1	Pearson Correlation	-.117	-.366**	-.168	-.067	-.217	.032	-.099	1	-.120	-.279*	.391**	-.468**	-.364**	.311*	.290*	-.331**	-.226	-.364**	.152	.062	-.297*	-.356**	-.346**	.068	.052
	Sig. (2-tailed)	.328	.002	.162	.577	.068	.796	.566		.319	.019	.001	.000	.002	.016	.018	.007	.068	.003	.223	.624	.017	.003	.005	.585	.677
	N	72	71	71	72	72	70	36	72	71	71	72	72	72	60	66	66	66	66	66	66	64	66	65	66	66
Total Dismissive RQ!	Pearson Correlation	.144	.281*	.146	.044	.074	.049	-.297	-.120	1	.589**	-.287*	.123	-.025	-.123	-.112	.092	.156	.312**	.155	.151	.188	.407**	.066	.258*	.035
	Sig. (2-tailed)	.227	.017	.221	.709	.535	.686	.074	.319		.000	.015	.298	.834	.346	.365	.454	.203	.010	.206	.218	.134	.001	.598	.033	.780
	N	72	72	72	73	73	71	37	71	73	73	72	73	73	61	68	68	68	68	68	68	65	68	67	68	68
Transformed Log Fear RQ	Pearson Correlation	.069	.213	.198	-.060	-.004	-.048	-.171	-.279*	.589**	1	-.361**	.169	.172	-.228	-.178	.325**	.271*	.404**	.074	.077	.242	.267*	.228	.288*	.096
	Sig. (2-tailed)	.567	.072	.095	.616	.971	.689	.312	.019	.000		.002	.153	.147	.077	.147	.007	.025	.001	.550	.532	.052	.018	.064	.017	.438
	N	72	72	72	73	73	71	37	71	73	73	72	73	73	61	68	68	68	68	68	68	65	68	67	68	68
Transform Inverse Depression DASS 1	Pearson Correlation	-.190	-.222	-.291*	-.099	-.178	-.133	.208	.391**	-.287*	-.361**	1	-.530**	-.623**	.281*	.254*	-.346**	-.325**	-.291*	.153	.106	-.447**	-.371**	-.354**	-.210	.023
	Sig. (2-tailed)	.103	.058	.012	.399	.127	.265	.217	.001	.015	.002		.000	.000	.027	.037	.004	.007	.016	.213	.389	.000	.002	.003	.086	.851
	N	75	74	74	75	75	72	37	72	72	72	75	75	74	62	68	68	68	68	68	68	65	68	67	68	68
Transformed Log Anxiety	Pearson Correlation	.263*	.284*	.202	.418**	.245*	.079	.140	-.468**	.123	.169	-.530**	1	.547**	-.243	-.085	.182	.298*	.296*	.055	.089	.444**	.335**	.315**	.325**	.167
	Sig. (2-tailed)	.023	.014	.082	.000	.033	.509	.401	.000	.298	.153	.000		.000	.057	.485	.135	.013	.013	.654	.468	.000	.005	.009	.006	.171
	N	75	75	75	76	76	73	38	72	73	73	75	76	75	62	69	69	69	69	69	69	66	69	68	69	69

Transformed Logarithm Stress DASS 1	Pearson Correlation	.080	.190	.253*	.096	.224	.213	-.365*	-.364**	-.025	.172	-.623**	.547**	1	-.381**	-.158	.493**	.369**	.336**	-.218	-.279*	.510**	.369**	.419**	.008	-.139
	Sig. (2-tailed)	.497	.106	.030	.413	.054	.070	.026	.002	.834	.147	.000	.000		.002	.199	.000	.002	.005	.074	.021	.000	.002	.000	.952	.258
	N	74	74	74	75	75	73	37	72	73	73	74	75	75	61	68	68	68	68	68	68	65	68	67	68	68
Transformed Sqrt Self Compassion	Pearson Correlation	-.087	-.059	-.295*	.110	-.016	-.137	.222	.311*	-.123	-.228	.281*	-.243	-.381**	1	.763**	-.710**	-.730**	-.639**	.777**	.755**	-.383**	-.300*	-.440**	-.073	.490**
	Sig. (2-tailed)	.502	.650	.021	.396	.904	.300	.239	.016	.346	.077	.027	.057	.002		.000	.000	.000	.000	.000	.000	.003	.018	.000	.573	.000
	N	62	61	61	62	62	59	30	60	61	61	62	62	61	62	62	62	62	62	62	62	59	62	61	62	62
Self Kindness Transformed Log	Pearson Correlation	-.195	-.108	-.354**	.023	.019	.089	-.159	.290*	-.112	-.178	.254*	-.085	-.158	.763**	1	-.352**	-.305*	-.376**	.789**	.617**	-.230	-.232	-.300*	-.095	.380**
	Sig. (2-tailed)	.111	.380	.003	.854	.880	.477	.354	.018	.365	.147	.037	.485	.199	.000		.003	.011	.001	.000	.000	.063	.055	.013	.440	.001
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
SC Overidentification	Pearson Correlation	-.067	-.038	.183	-.201	.005	.387**	-.476**	-.331**	.092	.325**	-.346**	.182	.493**	-.710**	-.352**	1	.628**	.552**	-.437**	-.439**	.590**	.411**	.694**	-.090	-.416**
	Sig. (2-tailed)	.587	.760	.135	.098	.966	.001	.003	.007	.454	.007	.004	.135	.000	.000	.003		.000	.000	.000	.000	.000	.000	.000	.462	.000
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
SC Isolation	Pearson Correlation	-.012	.070	.308*	-.057	-.016	.249*	-.405*	-.226	.156	.271*	-.325**	.298*	.369**	-.730**	-.305*	.628**	1	.591**	-.368**	-.398**	.342**	.243*	.391**	.161	-.244*
	Sig. (2-tailed)	.920	.570	.011	.640	.899	.044	.014	.068	.203	.025	.007	.013	.002	.000	.011	.000		.000	.002	.001	.005	.044	.001	.186	.044
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
SC Self Judgement	Pearson Correlation	.002	.107	.312**	-.099	.032	.180	-.285	-.364**	.312**	.404**	-.291*	.296*	.336**	-.639**	-.376**	.552**	.591**	1	-.230	-.157	.372**	.347**	.331**	.173	-.196
	Sig. (2-tailed)	.986	.385	.010	.420	.794	.149	.092	.003	.010	.001	.016	.013	.005	.000	.001	.000	.000		.057	.199	.002	.003	.006	.156	.107
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
Mindfulness SC	Pearson Correlation	-.052	.060	-.213	.164	.031	-.049	.040	.152	.155	.074	.153	.055	-.218	.777**	.789**	-.437**	-.368**	-.230	1	.810**	-.214	-.167	-.271*	.076	.509**
	Sig. (2-tailed)	.675	.630	.082	.179	.801	.696	.817	.223	.206	.550	.213	.654	.074	.000	.000	.000	.002	.057		.000	.085	.171	.025	.533	.000
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
Common Hiumanity SC	Pearson Correlation	.015	.083	-.178	.182	.047	-.023	.082	.062	.151	.077	.106	.089	-.279*	.755**	.617**	-.439**	-.398**	-.157	.810**	1	-.226	-.176	-.296*	.040	.517**
	Sig. (2-tailed)	.900	.503	.148	.134	.703	.857	.635	.624	.218	.532	.389	.468	.021	.000	.000	.000	.001	.199	.000		.068	.148	.014	.747	.000
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
Hyperarousal	Pearson Correlation	.008	.084	.254*	-.059	.203	.368**	-.298	-.297*	.188	.242	-.447**	.444**	.510**	-.383**	-.230	.590**	.342**	.372**	-.214	-.226	1	.699**	.839**	.121	-.020
	Sig. (2-tailed)	.946	.505	.041	.637	.102	.003	.082	.017	.134	.052	.000	.000	.000	.003	.063	.000	.005	.002	.085	.068		.000	.000	.335	.876
	N	65	65	65	66	66	63	35	64	65	65	65	66	65	59	66	66	66	66	66	66	66	66	66	66	66
Hyperarousal Reactive	Pearson Correlation	.272*	.281*	.361**	.073	.211	.089	-.219	-.356**	.407**	.287*	-.371**	.335**	.369**	-.300*	-.232	.411**	.243*	.347**	-.167	-.176	.699**	1	.482**	.149	-.094
	Sig. (2-tailed)	.025	.020	.003	.550	.082	.480	.200	.003	.001	.018	.002	.005	.002	.018	.055	.000	.044	.003	.171	.148	.000		.000	.223	.443
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
Transformed Hyperarousal Introspect	Pearson Correlation	-.164	-.017	.212	-.141	.102	.281*	-.131	-.346**	.066	.228	-.354**	.315**	.419**	-.440**	-.300*	.694**	.391**	.331**	-.271*	-.296*	.839**	.482**	1	.010	-.184
	Sig. (2-tailed)	.185	.894	.085	.251	.409	.023	.446	.005	.598	.064	.003	.009	.000	.000	.013	.000	.001	.006	.025	.014	.000	.000		.935	.134
	N	67	67	67	68	68	65	36	65	67	67	67	68	67	61	68	68	68	68	68	68	66	68	68	68	68
Transformed Sqare Root Suppression ERQ1	Pearson Correlation	-.023	-.204	.041	-.076	-.146	-.090	.277	.068	.258*	.288*	-.210	.325**	.008	-.073	-.095	-.090	.161	.173	.076	.040	.121	.149	.010	1	.343**
	Sig. (2-tailed)	.853	.096	.741	.527	.231	.470	.102	.585	.033	.017	.086	.006	.952	.573	.440	.462	.186	.156	.533	.747	.335	.223	.935		.004
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69
Reappraisal ERQ1	Pearson Correlation	.001	.100	-.199	.114	-.018	-.074	.042	.052	.035	.096	.023	.167	-.139	.490**	.380**	-.416**	-.244*	-.196	.509**	.517**	-.020	-.094	-.184	.343**	1
	Sig. (2-tailed)	.995	.417	.104	.350	.883	.554	.809	.677	.780	.438	.851	.171	.258	.000	.001	.000	.044	.107	.000	.000	.876	.443	.134	.004	
	N	68	68	68	69	69	66	36	66	68	68	68	69	68	62	69	69	69	69	69	69	66	69	68	69	69

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations[a]

Limited		ScleroHAQ Transformed Sqrt	PAIN	Raynaud	Transformed SQRT Breathing 1SHAQ	Transformed SQRT1 Intestinal SHAQ	Transformed Reflect Log Age Diag Scleroderma	AgeDiagRaynds	Total EMWS 1	Total Dismissive RQ!	Transformed Log Fear RQ	Transform Inverse Depression DASS 1	Transformed Log Anxiety	Transformed Logarithm Stress DASS 1	Transformed Sqrt Self Compassion	Self Kindness Transformed Log	SC Overidentification	SC Isolation	SC Self Judgement	Mindfulness SC	Common Hiumanity SC	Hyperarousal	Hyperarousal Reactive	Transformed Hyperarousal Introspect	Transformed Sqare Root Suppression ERQ1	Reappraisal ERQ1
ScleroHAQ Transformed Sqrt	Pearson Correlation	1	.452**	-.130	.352*	.229	-.307	.314	-.175	.241	.292	-.133	.313*	.038	-.132	-.086	.030	.210	.118	-.019	.094	-.072	.236	-.276	.307	.015
	Sig. (2-tailed)		.003	.417	.022	.145	.054	.191	.281	.134	.068	.402	.044	.814	.435	.607	.857	.206	.479	.908	.573	.676	.154	.098	.061	.929
	N	42	41	41	42	42	40	19	40	40	40	42	42	41	37	38	38	38	38	38	38	36	38	37	38	38
PAIN	Pearson Correlation	.452**	1	.264	.287	.607**	-.433**	.007	-.484**	.434**	.373*	-.304	.309*	.232	-.289	-.255	.052	.360*	.368*	-.058	-.012	.132	.420**	-.093	.183	.129
	Sig. (2-tailed)	.003		.100	.069	.000	.006	.976	.002	.006	.019	.053	.049	.149	.088	.128	.762	.029	.025	.732	.943	.449	.010	.591	.278	.446
	N	41	41	40	41	41	39	19	39	39	39	41	41	40	36	37	37	37	37	37	37	35	37	36	37	37
Raynaud	Pearson Correlation	-.130	.264	1	.166	.289	-.049	-.033	-.311	.013	.228	-.065	.158	.072	-.277	-.258	.066	.308	.377*	-.200	-.149	.021	.139	.089	.241	.033
	Sig. (2-tailed)	.417	.100		.300	.067	.768	.896	.054	.938	.163	.685	.325	.659	.102	.124	.696	.063	.021	.236	.380	.904	.414	.606	.150	.848
	N	41	40	41	41	41	39	18	39	39	39	41	41	40	36	37	37	37	37	37	37	35	37	36	37	37
Transformed SQRT Breathing 1SHAQ	Pearson Correlation	.352*	.287	.166	1	.238	-.288	.437	.129	.095	.087	-.166	.464**	.010	.271	.186	-.249	-.127	-.081	.286	.349*	.000	.049	-.147	.223	.286
	Sig. (2-tailed)	.022	.069	.300		.128	.072	.061	.426	.558	.595	.294	.002	.952	.105	.282	.131	.447	.630	.081	.032	.999	.770	.385	.178	.081
	N	42	41	41	42	42	40	19	40	40	40	42	42	41	37	38	38	38	38	38	38	36	38	37	38	38
Transformed SQRT1 Intestinal SHAQ	Pearson Correlation	.229	.607**	.289	.238	1	-.227	.233	-.275	.152	.119	-.324*	.235	.274	.055	.085	-.162	-.005	.198	.097	.108	.118	.183	-.091	.191	.162
	Sig. (2-tailed)	.145	.000	.067	.128		.158	.338	.086	.348	.464	.036	.135	.083	.745	.613	.330	.977	.233	.564	.518	.494	.271	.593	.251	.330
	N	42	41	41	42	42	40	19	40	40	40	42	42	41	37	38	38	38	38	38	38	36	38	37	38	38
Transformed Reflect Log Age Diag Scleroderma	Pearson Correlation	-.307	-.433**	-.049	-.288	-.227	1	-.763**	.070	.222	.119	-.067	-.106	.051	-.077	.089	.267	.122	.104	.136	.060	.365*	.002	.336*	.038	.076
	Sig. (2-tailed)	.054	.006	.768	.072	.158		.000	.674	.175	.472	.680	.516	.753	.658	.605	.116	.479	.546	.429	.729	.034	.989	.049	.824	.660
	N	40	39	39	40	40	41	18	39	39	39	40	40	40	35	36	36	36	36	36	36	34	36	35	36	36
AgeDiagRaynds	Pearson Correlation	.314	.007	-.033	.437	.233	-.763**	1	-.113	-.629**	-.269	.062	.557*	-.009	.413	.110	-.362	-.267	-.409	.259	.335	-.206	-.198	.133	.501*	-.226
	Sig. (2-tailed)	.191	.976	.896	.061	.338	.000		.656	.005	.280	.802	.013	.971	.099	.675	.154	.301	.103	.315	.189	.443	.446	.610	.041	.384
	N	19	19	18	19	19	18	19	18	18	18	19	19	18	17	17	17	17	17	17	17	16	17	17	17	17
Total EMWS 1	Pearson Correlation	-.175	-.484**	-.311	.129	-.275	.070	-.113	1	-.201	-.239	.496**	-.510**	-.452**	.704**	.577**	-.424**	-.639**	-.637**	.521**	.330*	-.215	-.347*	-.249	-.098	.419**
	Sig. (2-tailed)	.281	.002	.054	.426	.086	.674	.656		.214	.137	.001	.001	.003	.000	.000	.009	.000	.000	.001	.046	.216	.035	.142	.566	.010
	N	40	39	39	40	40	39	18	40	40	40	40	40	40	36	37	37	37	37	37	37	35	37	36	37	37
Total Dismissive RQ!	Pearson Correlation	.241	.434**	.013	.095	.152	.222	-.629**	-.201	1	.574**	-.373*	.142	.016	-.097	-.138	.064	.162	.348*	.204	.253	.194	.496**	.012	.309	.241
	Sig. (2-tailed)	.134	.006	.938	.558	.348	.175	.005	.214		.000	.018	.381	.924	.573	.414	.705	.338	.035	.227	.130	.264	.002	.947	.063	.151
	N	40	39	39	40	40	39	18	40	40	40	40	40	40	36	37	37	37	37	37	37	35	37	36	37	37
Transformed Log Fear RQ	Pearson Correlation	.292	.373*	.228	.087	.119	.119	-.269	-.239	.574**	1	-.332*	.144	.183	-.335*	-.282	.334*	.291	.463**	.022	.021	.113	.296	.053	.312	.076
	Sig. (2-tailed)	.068	.019	.163	.595	.464	.472	.280	.137	.000		.036	.375	.260	.046	.091	.043	.080	.004	.896	.901	.517	.076	.757	.060	.653
	N	40	39	39	40	40	39	18	40	40	40	40	40	40	36	37	37	37	37	37	37	35	37	36	37	37
Transform Inverse Depression DASS 1	Pearson Correlation	-.133	-.304	-.065	-.166	-.324*	-.067	.062	.496**	-.373*	-.332*	1	-.615**	-.544**	.284	.289	-.122	-.272	-.353*	.075	.125	-.260	-.292	-.109	-.478**	.064
	Sig. (2-tailed)	.402	.053	.685	.294	.036	.680	.802	.001	.018	.036		.000	.000	.088	.103	.466	.099	.030	.653	.453	.125	.076	.522	.002	.701
	N	42	41	41	42	42	40	19	40	40	40	42	42	41	37	38	38	38	38	38	38	36	38	37	38	38
Transformed Log Anxiety	Pearson Correlation	.313*	.309*	.158	.464**	.235	-.106	.557*	-.510**	.142	.144	-.615**	1	.528**	-.212	-.226	.117	.274	.291	-.071	-.025	.365*	.366*	.249	.446**	-.045
	Sig. (2-tailed)	.044	.049	.325	.002	.135	.516	.013	.001	.381	.375	.000		.000	.209	.173	.485	.096	.076	.674	.882	.029	.023	.138	.005	.787
	N	42	41	41	42	42	40	19	40	40	40	42	42	41	37	38	38	38	38	38	38	36	38	37	38	38

Transformed Logarithm Stress DASS 1	Pearson Correlation	.038	.232	.072	.010	.274	.051	-.009	-.452**	.016	.183	-.544**	.528**	1	-.307	-.072	.348*	.249	.305	-.160	-.405*	.395*	.325*	.261	.030	-.275
	Sig. (2-tailed)	.814	.149	.659	.952	.083	.753	.971	.003	.924	.260	.000	.000		.069	.673	.035	.138	.066	.345	.013	.019	.050	.124	.860	.099
	N	41	40	40	41	41	40	18	40	40	40	41	41	41	36	37	37	37	37	37	37	35	37	36	37	37
Transformed Sqrt Self Compassion	Pearson Correlation	-.132	-.289	-.277	.271	.055	-.077	.413	.704**	-.097	-.335*	.284	-.212	-.307	1	.829**	-.753**	-.745**	-.660**	.774**	.736**	-.267	-.228	-.367*	.120	.559**
	Sig. (2-tailed)	.435	.088	.102	.105	.745	.658	.099	.000	.573	.046	.088	.209	.069		.000	.000	.000	.000	.000	.000	.121	.174	.028	.480	.000
	N	37	36	36	37	37	35	17	36	36	36	37	37	36	37	37	37	37	37	37	37	35	37	36	37	37
Self Kindness Transformed Log	Pearson Correlation	-.066	-.255	-.258	.186	.085	.089	.110	.577**	-.138	-.282	.269	-.226	-.072	.829**	1	-.468**	-.423**	-.498**	.760**	.587**	-.191	-.295	-.315	-.131	.490**
	Sig. (2-tailed)	.697	.128	.124	.262	.613	.605	.675	.000	.414	.091	.103	.173	.673	.000		.003	.008	.001	.000	.000	.264	.072	.058	.434	.002
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
SC Overidentification	Pearson Correlation	.030	.052	.066	-.249	-.162	.267	-.362	-.424**	.064	.334*	-.122	.117	.348*	-.753**	-.468**	1	.541**	.468**	-.491**	-.523**	.398*	.250	.564**	-.249	-.464**
	Sig. (2-tailed)	.857	.762	.696	.131	.330	.116	.154	.009	.705	.043	.466	.485	.035	.000	.003		.000	.003	.002	.001	.016	.130	.000	.131	.003
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
SC Isolation	Pearson Correlation	.210	.360*	.308	-.127	-.005	.122	-.267	-.639**	.162	.291	-.272	.274	.249	-.745**	-.423**	.541**	1	.596**	-.356*	-.386*	.129	.062	.223	-.041	-.241
	Sig. (2-tailed)	.206	.029	.063	.447	.977	.479	.301	.000	.338	.080	.099	.096	.138	.000	.008	.000		.000	.028	.017	.452	.710	.184	.805	.145
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
SC Self Judgement	Pearson Correlation	.118	.368*	.377*	-.081	.198	.104	-.409	-.637**	.348*	.463**	-.353*	.291	.305	-.669**	-.498**	.468**	.596**	1	-.236	-.185	.203	.223	.135	.043	-.112
	Sig. (2-tailed)	.479	.025	.021	.630	.233	.546	.103	.000	.035	.004	.030	.076	.066	.000	.001	.003	.000		.154	.267	.235	.179	.427	.798	.503
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
Mindfulness SC	Pearson Correlation	-.019	-.058	-.200	.266	.097	.136	.259	.521**	.204	.022	.075	-.071	-.160	.774**	.760**	-.491**	-.356*	-.236	1	.780**	-.166	-.182	-.288	.229	.677**
	Sig. (2-tailed)	.908	.732	.236	.081	.564	.429	.315	.001	.227	.896	.653	.674	.345	.000	.000	.002	.028	.154		.000	.334	.275	.084	.166	.000
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
Common Hiumanity SC	Pearson Correlation	.094	-.012	-.149	.349*	.108	.060	.335	.330*	.253	.021	.125	-.025	-.405*	.736**	.587**	-.523**	-.386*	-.185	.780**	1	-.203	-.081	-.309	.198	.636**
	Sig. (2-tailed)	.573	.943	.380	.032	.518	.729	.189	.046	.130	.901	.453	.882	.013	.000	.000	.001	.017	.267	.000		.235	.627	.063	.234	.000
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
Hyperarousal	Pearson Correlation	-.072	.132	.021	.000	.118	.365*	-.206	-.215	.194	.113	-.260	.365*	.395*	-.267	-.191	.398*	.129	.203	-.166	-.203	1	.659**	.795**	.044	.025
	Sig. (2-tailed)	.676	.449	.904	.999	.494	.034	.443	.216	.264	.517	.125	.029	.019	.121	.264	.016	.452	.235	.334	.235		.000	.000	.800	.886
	N	36	35	35	36	36	34	16	35	35	35	36	36	35	35	36	36	36	36	36	36	36	36	36	36	36
Hyperarousal Reactive	Pearson Correlation	.236	.420**	.139	.049	.183	.002	-.198	-.347*	.496**	.296	-.292	.368*	.325*	-.228	-.295	.250	.062	.223	-.182	-.081	.659**	1	.363*	.271	.021
	Sig. (2-tailed)	.154	.010	.414	.770	.271	.989	.446	.035	.002	.076	.076	.023	.050	.174	.072	.130	.710	.179	.275	.627	.000		.027	.100	.899
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
Transformed Hyperarousal Introspect	Pearson Correlation	-.276	-.093	.089	-.147	-.091	.336*	.133	-.249	.012	.053	-.109	.249	.261	-.367*	-.315	.564**	.223	.135	-.288	-.309	.795**	.363*	1	-.115	-.234
	Sig. (2-tailed)	.098	.591	.606	.385	.593	.049	.610	.142	.947	.757	.522	.138	.124	.028	.058	.000	.184	.427	.084	.063	.000	.027		.499	.164
	N	37	36	36	37	37	35	17	36	36	36	37	37	36	36	37	37	37	37	37	37	36	37	37	37	37
Transformed Sqare Root Suppression ERQ1	Pearson Correlation	.307	.183	.241	.223	.191	.038	.501*	-.098	.309	.312	-.478**	.446**	.030	.120	-.131	-.249	-.041	.043	.229	.198	.044	.271	-.115	1	.378*
	Sig. (2-tailed)	.061	.278	.150	.178	.251	.824	.041	.566	.063	.060	.002	.005	.860	.480	.434	.131	.805	.798	.166	.234	.800	.100	.499		.019
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38
Reappraisal ERQ1	Pearson Correlation	.015	.129	.033	.286	.162	.076	-.226	.419**	.241	.076	.064	-.045	-.275	.559**	.490**	-.464**	-.241	-.112	.677**	.636**	.025	.021	-.234	.378*	1
	Sig. (2-tailed)	.929	.446	.848	.081	.330	.660	.384	.010	.151	.653	.701	.787	.099	.000	.002	.003	.145	.503	.000	.000	.886	.899	.164	.019	
	N	38	37	37	38	38	36	17	37	37	37	38	38	37	37	38	38	38	38	38	38	36	38	37	38	38

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Sclero Limited Diffuse = 1.00

Correlations[a]

Diffuse		ScleroHAQ Transformed Sqrt	PAIN	Raynaud	Transformed SQRT Breathing 1SHAQ	Transformed SQRT1 Intestinal SHAQ	Transformed Reflect Log Age Diag Scleroderma	AgeDiagRaynds	Total EMWS 1	Total Dismissive RQI	Transformed Log Fear RQ	Transform Inverse Depression DASS 1	Transformed Log Anxiety	Transformed Logarithm Stress DASS 1	Transformed Sqrt Self Compassion	Self Kindness Transformed Log	SC Overidentification	SC Isolation	SC Self Judgement	Mindfulness SC	Common Humanity SC	Hyperarousal	Hyperarousal Reactive	Transformed Hyperarousal Introspect	Transformed Sqare Root Suppression ERQ1	Reappraisal ERQ1
ScleroHAQ Transformed Sqrt	Pearson Correlation	1	.549**	.506**	.336	.279	.090	.369	-.028	.003	-.217	-.270	.172	.152	-.140	-.438*	-.131	-.191	-.069	-.261	-.168	.063	.217	-.044	-.354	-.055
	Sig. (2-tailed)		.001	.000	.056	.116	.625	.132	.879	.985	.232	.128	.338	.398	.504	.015	.491	.312	.719	.163	.375	.746	.249	.819	.055	.774
	N	33	33	33	33	33	32	18	32	32	32	33	33	33	25	30	30	30	30	30	30	29	30	30	30	30
PAIN	Pearson Correlation	.549**	1	.372*	.421*	.544**	.187	-.077	-.246	.009	-.029	-.126	.249	.133	.201	.000	-.116	-.198	-.112	.139	.164	.010	.089	.071	-.587**	.056
	Sig. (2-tailed)	.001		.030	.013	.001	.297	.755	.174	.960	.873	.485	.156	.453	.335	.998	.533	.285	.550	.456	.377	.958	.633	.702	.001	.767
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31
Raynaud	Pearson Correlation	.506**	.372*	1	.278	.157	.136	-.139	-.032	.334	.175	-.513**	.236	.450**	-.461*	-.545**	.321	.364*	.307	-.379*	-.286	.438*	.517**	.325	-.122	-.421*
	Sig. (2-tailed)	.000	.030		.111	.374	.450	.572	.861	.057	.330	.002	.179	.008	.020	.002	.078	.044	.093	.036	.119	.015	.003	.075	.513	.018
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31
Transformed SQRT Breathing 1SHAQ	Pearson Correlation	.336	.421*	.278	1	.499**	.013	.161	-.238	-.039	-.259	-.031	.356*	.207	-.107	-.174	-.143	.021	-.108	.013	-.023	-.140	.074	-.133	-.362*	-.064
	Sig. (2-tailed)	.056	.013	.111		.003	.945	.509	.190	.830	.145	.864	.039	.239	.611	.350	.442	.911	.563	.946	.903	.462	.690	.476	.045	.734
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31
Transformed SQRT1 Intestinal SHAQ	Pearson Correlation	.279	.544**	.157	.499**	1	.261	-.092	-.159	-.041	-.160	-.034	.260	.171	-.114	-.065	.159	-.012	-.081	-.064	-.033	.281	.226	.275	-.416*	-.179
	Sig. (2-tailed)	.116	.001	.374	.003		.143	.707	.384	.821	.374	.851	.138	.334	.587	.729	.392	.948	.667	.731	.859	.132	.221	.135	.020	.335
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31
Transformed Reflect Log Age Diag Scleroderma	Pearson Correlation	.090	.187	.136	.013	.261	1	-.967**	.018	-.205	-.261	-.202	.281	.400*	-.244	.087	.493**	.358	.240	-.228	-.111	.375*	.179	.232	-.190	-.194
	Sig. (2-tailed)	.625	.297	.450	.945	.143		.000	.922	.260	.149	.267	.113	.021	.250	.648	.006	.052	.201	.225	.560	.045	.345	.217	.315	.304
	N	32	33	33	33	33	34	19	31	32	32	32	33	33	24	30	30	30	30	30	30	29	30	30	30	30
AgeDiagRaynds	Pearson Correlation	.369	-.077	-.139	.161	-.092	-.967**	1	-.109	.036	-.088	.357	-.189	-.592**	.028	-.323	-.548*	-.494*	-.223	-.058	-.054	-.364	-.221	-.315	.142	.164
	Sig. (2-tailed)	.132	.755	.572	.509	.707	.000		.667	.882	.721	.146	.430	.008	.927	.177	.015	.032	.358	.813	.826	.126	.363	.189	.561	.502
	N	18	19	19	19	19	19	19	18	19	19	18	19	19	13	19	19	19	19	19	19	19	19	19	19	19
Total EMWS 1	Pearson Correlation	-.028	-.246	-.032	-.238	-.159	.018	-.109	1	-.015	-.338	.324	-.415*	-.302	-.039	.104	-.276	.097	-.170	-.095	-.161	-.367	-.346	-.441*	.210	-.242
	Sig. (2-tailed)	.879	.174	.861	.190	.384	.922	.667		.936	.063	.070	.018	.093	.858	.592	.148	.618	.379	.624	.406	.050	.066	.017	.274	.206
	N	32	32	32	32	32	31	18	32	31	31	32	32	32	24	29	29	29	29	29	29	29	29	29	29	29
Total Dismissive RQI	Pearson Correlation	.003	.009	.334	-.039	-.041	-.205	.036	-.015	1	.626**	-.171	.087	-.097	-.208	-.101	.147	.172	.311	.097	-.011	.181	.285	.154	.215	-.254
	Sig. (2-tailed)	.985	.960	.057	.830	.821	.260	.882	.936		.000	.349	.629	.593	.318	.587	.431	.355	.089	.602	.954	.339	.121	.409	.244	.167
	N	32	33	33	33	33	32	19	31	33	33	32	33	33	25	31	31	31	31	31	31	30	31	31	31	31
Transformed Log Fear RQ	Pearson Correlation	-.217	-.029	.175	-.259	-.160	-.261	-.088	-.338	.626**	1	-.407*	.209	.157	-.133	-.071	.330	.268	.371*	.141	.152	.427*	.288	.459**	.275	.120
	Sig. (2-tailed)	.232	.873	.330	.145	.374	.149	.721	.063	.000		.021	.244	.382	.527	.704	.070	.145	.040	.448	.415	.019	.116	.009	.134	.521
	N	32	33	33	33	33	32	19	31	33	33	32	33	33	25	31	31	31	31	31	31	30	31	31	31	31
Transform Inverse Depression DASS 1	Pearson Correlation	-.270	-.126	-.513**	-.031	-.034	-.202	.357	.324	-.171	-.407*	1	-.447**	-.716**	.313	.241	-.549**	-.369*	-.242	.228	.080	-.672**	-.512**	-.589**	.017	-.019
	Sig. (2-tailed)	.128	.485	.002	.864	.851	.267	.146	.070	.349	.021		.009	.000	.127	.199	.002	.045	.198	.225	.676	.000	.004	.001	.929	.920
	N	33	33	33	33	33	32	18	32	32	32	33	33	33	25	30	30	30	30	30	30	29	30	30	30	30
Transformed Log Anxiety	Pearson Correlation	.172	.249	.236	.356*	.260	.281	-.189	-.415*	.087	.209	-.447**	1	.604**	-.376	-.026	.301	.383*	.345	.074	.158	.527**	.229	.415*	.199	.364*
	Sig. (2-tailed)	.338	.156	.179	.039	.138	.113	.439	.018	.629	.244	.009		.000	.064	.890	.100	.033	.057	.693	.395	.003	.215	.020	.282	.044
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31

Transformed Logarithm Stress DASS 1	Pearson Correlation	.152	.133	.450**	.207	.171	.400*	-.592**	-.302	-.097	.157	-.716**	.604**	1	-.506**	-.251	.654**	.496**	.373*	-.298	-.131	.658**	.466**	.509**	-.011	.002
	Sig. (2-tailed)	.398	.453	.008	.239	.334	.021	.008	.093	.593	.382	.000	.000		.010	.174	.000	.005	.039	.104	.482	.000	.008	.000	.953	.990
	N	33	34	34	34	34	33	19	32	33	33	33	34	34	25	31	31	31	31	31	31	30	31	31	31	31
Transformed Sqrt Self Compassion	Pearson Correlation	-.140	.201	-.461*	-.107	-.114	-.244	.028	-.039	-.208	-.133	.313	-.376	-.506**	1	.673**	-.678**	-.723**	-.637**	.763**	.756**	-.669**	-.593**	-.569**	-.284	.380
	Sig. (2-tailed)	.504	.335	.020	.611	.587	.250	.927	.858	.318	.527	.127	.064	.010		.000	.000	.000	.001	.000	.000	.000	.002	.003	.169	.061
	N	25	25	25	25	25	24	13	24	25	25	25	25	25	25	25	25	25	25	25	25	24	25	25	25	25
Self Kindness Transformed Log	Pearson Correlation	-.438*	.000	-.545**	-.174	-.065	.087	-.323	.104	-.101	-.071	.241	-.026	-.251	.673**	1	-.219	-.168	-.273	.788**	.610**	-.345	-.326	-.292	-.094	.254
	Sig. (2-tailed)	.015	.998	.002	.350	.729	.648	.177	.592	.587	.704	.199	.890	.174	.000		.236	.365	.138	.000	.000	.062	.073	.111	.616	.169
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
SC Overidentification	Pearson Correlation	-.131	-.116	.321	-.143	.159	.493**	-.548*	-.276	.147	.330	-.549**	.301	.654**	-.678**	-.219	1	.694**	.615**	-.374*	-.335	.828**	.672**	.822**	.052	-.360*
	Sig. (2-tailed)	.491	.533	.078	.442	.392	.006	.015	.148	.431	.070	.002	.100	.000	.000	.236		.000	.000	.038	.065	.000	.000	.000	.782	.047
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
SC Isolation	Pearson Correlation	-.191	-.198	.364*	.021	-.012	.358	-.494*	.097	.172	.268	-.369*	.383*	.496**	-.723**	-.168	.694**	1	.584**	-.349	-.387*	.587**	.508**	.543**	.333	-.227
	Sig. (2-tailed)	.312	.285	.044	.911	.948	.052	.032	.618	.355	.145	.045	.033	.005	.000	.365	.000		.001	.055	.031	.001	.004	.002	.067	.220
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
SC Self Judgement	Pearson Correlation	-.069	-.112	.307	-.108	-.081	.240	-.223	-.170	.311	.371*	-.242	.345	.373*	-.637**	-.273	.615**	.584**	1	-.208	-.113	.548**	.528**	.493**	.272	-.246
	Sig. (2-tailed)	.719	.550	.093	.563	.667	.201	.358	.379	.089	.040	.198	.057	.039	.001	.138	.000	.001		.262	.544	.002	.002	.005	.138	.182
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Mindfulness SC	Pearson Correlation	-.261	.139	-.379*	.013	-.064	-.228	-.058	-.095	.097	.141	.228	.074	-.298	.763**	.788**	-.374*	-.349	-.208	1	.832**	-.382*	-.388*	-.275	-.083	.345
	Sig. (2-tailed)	.163	.456	.036	.946	.731	.225	.813	.624	.602	.448	.225	.693	.104	.000	.000	.038	.055	.262		.000	.037	.031	.135	.658	.057
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Common Hiumanity SC	Pearson Correlation	-.168	.164	-.286	-.023	-.033	-.111	-.054	-.161	-.011	.152	.080	.158	-.131	.756**	.610**	-.335	-.387*	-.113	.832**	1	-.314	-.427*	-.285	-.127	.384*
	Sig. (2-tailed)	.375	.377	.119	.903	.859	.560	.826	.406	.954	.415	.676	.395	.482	.000	.000	.065	.031	.544	.000		.091	.017	.120	.496	.033
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Hyperarousal	Pearson Correlation	.063	.010	.438*	-.140	.281	.375*	-.364	-.367	.181	.427*	-.672**	.527**	.656**	-.669**	-.345	.828**	.587**	.548**	-.382*	-.314	1	.747**	.903**	.179	-.094
	Sig. (2-tailed)	.746	.958	.015	.462	.132	.045	.126	.050	.339	.019	.000	.003	.000	.000	.062	.000	.001	.002	.037	.091		.000	.000	.344	.621
	N	29	30	30	30	30	29	19	29	30	30	29	30	30	24	30	30	30	30	30	30	30	30	30	30	30
Hyperarousal Reactive	Pearson Correlation	.217	.089	.517**	.074	.226	.179	-.221	-.346	.285	.288	-.512**	.229	.466**	-.593**	-.326	.672**	.508**	.528**	-.388*	-.427*	.747**	1	.663**	.014	-.282
	Sig. (2-tailed)	.249	.633	.003	.690	.221	.345	.363	.066	.121	.116	.004	.215	.008	.002	.073	.000	.004	.002	.031	.017	.000		.000	.938	.124
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Transformed Hyperarousal Introspect	Pearson Correlation	-.044	.071	.325	-.133	.275	.232	-.315	-.441*	.154	.459**	-.589**	.415*	.599**	-.569**	-.292	.822**	.543**	.493**	-.275	-.285	.903**	.663**	1	.121	-.135
	Sig. (2-tailed)	.819	.702	.075	.476	.135	.217	.189	.017	.409	.009	.001	.020	.000	.003	.111	.000	.002	.005	.135	.120	.000	.000		.516	.469
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Transformed Sqare Root Suppression ERQ1	Pearson Correlation	-.354	-.587**	-.122	-.362*	-.416*	-.190	.142	.210	.215	.275	.017	.199	-.011	-.284	-.094	.052	.333	.272	-.083	-.127	.179	.014	.121	1	.310
	Sig. (2-tailed)	.055	.001	.513	.045	.020	.315	.561	.274	.244	.134	.929	.282	.953	.169	.616	.782	.067	.138	.658	.496	.344	.938	.516		.089
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31
Reappraisal ERQ1	Pearson Correlation	-.055	.056	-.421*	-.064	-.170	-.194	.164	-.242	-.254	.120	-.019	.364*	.002	.380	.254	-.360*	-.227	-.246	.345	.384*	-.094	-.282	-.135	.310	1
	Sig. (2-tailed)	.774	.767	.018	.734	.335	.304	.502	.206	.167	.521	.920	.044	.990	.061	.169	.047	.220	.182	.057	.033	.621	.124	.469	.089	
	N	30	31	31	31	31	30	19	29	31	31	30	31	31	25	31	31	31	31	31	31	30	31	31	31	31

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Sclero Limited Diffuse = 2.00

Correlations[a]

Scleroderma		Transformed Inverse Depression	Transformed Inverse Anxiety	Transformed SQRT Stress	Transformed SQRT Pain	Total EMWS	RQ Insecure Dismissive	Transformed SQRT Fearful Attachment	Self Compassion	Hyperarousal	ERQ Suppresion	AgeDiagBC Sclero
Transformed Inverse Depression	Pearson Correlation	1	.543**	-.644**	-.302**	.374**	-.278**	-.364**	.372**	-.421**	-.262*	.173
	Sig. (2-tailed)		.000	.000	.004	.000	.010	.001	.001	.000	.019	.106
	N	92	92	91	91	88	86	85	79	77	80	88
Transformed Inverse Anxiety	Pearson Correlation	.543**	1	-.579**	-.344**	.443**	-.098	-.191	.193	-.408**	-.354**	.028
	Sig. (2-tailed)	.000		.000	.001	.000	.366	.078	.086	.000	.001	.795
	N	92	93	92	92	88	87	86	80	78	81	89
Transformed SQRT Stress	Pearson Correlation	-.644**	-.579**	1	.255*	-.345**	.009	.231*	-.439**	.500**	.093	-.225*
	Sig. (2-tailed)	.000	.000		.015	.001	.931	.033	.000	.000	.412	.035
	N	91	92	92	91	88	87	86	80	77	80	88
Transformed SQRT Pain	Pearson Correlation	-.302**	-.344**	.255*	1	-.335**	.294**	.190	-.044	.019	-.039	.094
	Sig. (2-tailed)	.004	.001	.015		.001	.006	.082	.702	.871	.730	.385
	N	91	92	91	92	87	86	85	79	77	80	88
Total EMWS	Pearson Correlation	.374**	.443**	-.345**	-.335**	1	-.183	-.360**	.340**	-.312**	.007	-.023
	Sig. (2-tailed)	.000	.000	.001	.001		.093	.001	.002	.006	.950	.836
	N	88	88	88	87	88	85	84	78	76	78	84
RQ Insecure Dismissive	Pearson Correlation	-.278**	-.098	.009	.294**	-.183	1	.580**	-.102	.235*	.247*	-.104
	Sig. (2-tailed)	.010	.366	.931	.006	.093		.000	.369	.040	.027	.350
	N	86	87	87	86	85	87	86	80	77	80	83
Transformed SQRT Fearful Attachment	Pearson Correlation	-.364**	-.191	.231*	.190	-.360**	.580**	1	-.260*	.323**	.309**	-.076
	Sig. (2-tailed)	.001	.078	.033	.082	.001	.000		.021	.004	.006	.495
	N	85	86	86	85	84	86	86	79	76	79	82
Self Compassion	Pearson Correlation	.372**	.193	-.439**	-.044	.340**	-.102	-.260*	1	-.425**	-.096	.163
	Sig. (2-tailed)	.001	.086	.000	.702	.002	.369	.021		.000	.396	.160
	N	79	80	80	79	78	80	79	80	77	80	76
Hyperarousal	Pearson Correlation	-.421**	-.408**	.500**	.019	-.312**	.235*	.323**	-.425**	1	.105	-.346**
	Sig. (2-tailed)	.000	.000	.000	.871	.006	.040	.004	.000		.358	.002
	N	77	78	77	77	76	77	76	77	78	78	74
ERQ Suppresion	Pearson Correlation	-.262*	-.354**	.093	-.039	.007	.247*	.309**	-.096	.105	1	.043
	Sig. (2-tailed)	.019	.001	.412	.730	.950	.027	.006	.396	.358		.709
	N	80	81	80	80	78	80	79	80	78	81	77
AgeDiagBC Sclero	Pearson Correlation	.173	.028	-.225*	.094	-.023	-.104	-.076	.163	-.346**	.043	1
	Sig. (2-tailed)	.106	.795	.035	.385	.836	.350	.495	.160	.002	.709	
	N	88	89	88	88	84	83	82	76	74	77	91

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. ScleroBC = Scleroderma

Correlations[a]

Breast Cancer		Transformed Inverse Depression	Transformed Inverse Anxiety	Transformed SQRT Stress	Transformed SQRT Pain	Total EMWS	RQ Insecure Dismissive	Transformed SQRT Fearful Attachment	Self Compassion	Hyperarousal	ERQ Suppresion	AgeDiagBC Sclero
Transformed Inverse Depression	Pearson Correlation	1	.388	-.493*	-.151	.358	-.562**	-.327	.514*	-.382	-.344	.120
	Sig. (2-tailed)		.074	.020	.503	.101	.007	.138	.014	.079	.117	.604
	N	22	22	22	22	22	22	22	22	22	22	21
Transformed Inverse Anxiety	Pearson Correlation	.388	1	-.321	-.356	.019	-.397	-.364	.107	-.206	-.538**	-.068
	Sig. (2-tailed)	.074		.145	.103	.933	.067	.096	.636	.357	.010	.771
	N	22	22	22	22	22	22	22	22	22	22	21
Transformed SQRT Stress	Pearson Correlation	-.493*	-.321	1	.143	-.033	.452*	.331	-.557**	.609**	.090	-.424
	Sig. (2-tailed)	.020	.145		.525	.883	.034	.133	.007	.003	.689	.056
	N	22	22	22	22	22	22	22	22	22	22	21
Transformed SQRT Pain	Pearson Correlation	-.151	-.356	.143	1	-.005	.032	.163	.018	.024	.419	-.020
	Sig. (2-tailed)	.503	.103	.525		.982	.887	.468	.936	.915	.052	.929
	N	22	22	22	23	22	22	22	22	22	22	22
Total EMWS	Pearson Correlation	.358	.019	-.033	-.005	1	-.025	-.272	.264	-.058	-.234	-.228
	Sig. (2-tailed)	.101	.933	.883	.982		.914	.222	.236	.799	.294	.319
	N	22	22	22	22	22	22	22	22	22	22	21
RQ Insecure Dismissive	Pearson Correlation	-.562**	-.397	.452*	.032	-.025	1	.478*	-.242	.382	.102	.025
	Sig. (2-tailed)	.007	.067	.034	.887	.914		.025	.278	.079	.650	.914
	N	22	22	22	22	22	22	22	22	22	22	21
Transformed SQRT Fearful Attachment	Pearson Correlation	-.327	-.364	.331	.163	-.272	.478*	1	-.171	.289	.534*	-.152
	Sig. (2-tailed)	.138	.096	.133	.468	.222	.025		.446	.191	.011	.512
	N	22	22	22	22	22	22	22	22	22	22	21
Self Compassion	Pearson Correlation	.514*	.107	-.557**	.018	.264	-.242	-.171	1	-.492*	.041	.603**
	Sig. (2-tailed)	.014	.636	.007	.936	.236	.278	.446		.020	.856	.004
	N	22	22	22	22	22	22	22	22	22	22	21
Hyperarousal	Pearson Correlation	-.382	-.206	.609**	.024	-.058	.382	.289	-.492*	1	-.063	-.121
	Sig. (2-tailed)	.079	.357	.003	.915	.799	.079	.191	.020		.779	.602
	N	22	22	22	22	22	22	22	22	22	22	21
ERQ Suppresion	Pearson Correlation	-.344	-.538**	.090	.419	-.234	.102	.534*	.041	-.063	1	.058
	Sig. (2-tailed)	.117	.010	.689	.052	.294	.650	.011	.856	.779		.804
	N	22	22	22	22	22	22	22	22	22	22	21
AgeDiagBC Sclero	Pearson Correlation	.120	-.068	-.424	-.020	-.228	.025	-.152	.603**	-.121	.058	1
	Sig. (2-tailed)	.604	.771	.056	.929	.319	.914	.512	.004	.602	.804	
	N	21	21	21	22	21	21	21	21	21	21	23

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

a. ScleroBC = Breast Cancer

Correlations

Total Illness Scleroderma Breast Cancer		Transformed Inverse Depression	Transformed Inverse Anxiety	Transformed SQRT Stress	Transformed SQRT Pain	Total EMWS	RQ Insecure Dismissive	Transformed SQRT Fearful Attachment	Self Compassion	Hyperarousal	ERQ Suppresion	AgeDiagBC Sclero
Transformed Inverse Depression	Pearson Correlation	1	.511**	-.613**	-.260**	.370**	-.337**	-.343**	.397**	-.410**	-.279**	.163
	Sig. (2-tailed)		.000	.000	.005	.000	.000	.000	.000	.000	.004	.091
	N	114	114	113	113	110	108	107	101	99	102	109
Transformed Inverse Anxiety	Pearson Correlation	.511**	1	-.540**	-.351**	.361**	-.149	-.200*	.174	-.365**	-.384**	.026
	Sig. (2-tailed)	.000		.000	.000	.000	.122	.038	.080	.000	.000	.791
	N	114	115	114	114	110	109	108	102	100	103	110
Transformed SQRT Stress	Pearson Correlation	-.613**	-.540**	1	.228*	-.285**	.085	.240*	-.455**	.518**	.092	-.248**
	Sig. (2-tailed)	.000	.000		.015	.003	.377	.012	.000	.000	.359	.009
	N	113	114	114	113	110	109	108	102	99	102	109
Transformed SQRT Pain	Pearson Correlation	-.260**	-.351**	.228*	1	-.249**	.228*	.140	-.021	.014	.075	.045
	Sig. (2-tailed)	.005	.000	.015		.009	.018	.149	.837	.891	.452	.644
	N	113	114	113	115	109	108	107	101	99	102	110
Total EMWS	Pearson Correlation	.370**	.361**	-.285**	-.249**	1	-.149	-.321**	.320**	-.251*	-.048	-.049
	Sig. (2-tailed)	.000	.000	.003	.009		.126	.001	.001	.013	.636	.623
	N	110	110	110	109	110	107	106	100	98	100	105
RQ Insecure Dismissive	Pearson Correlation	-.337**	-.149	.085	.228*	-.149	1	.536**	-.125	.264**	.219*	-.082
	Sig. (2-tailed)	.000	.122	.377	.018	.126		.000	.211	.008	.027	.409
	N	108	109	109	108	107	109	108	102	99	102	104
Transformed SQRT Fearful Attachment	Pearson Correlation	-.343**	-.200*	.240*	.140	-.321**	.536**	1	-.243*	.311**	.353**	-.056
	Sig. (2-tailed)	.000	.038	.012	.149	.001	.000		.014	.002	.000	.575
	N	107	108	108	107	106	108	108	101	98	101	103
Self Compassion	Pearson Correlation	.397**	.174	-.455**	-.021	.320**	-.125	-.243*	1	-.437**	-.072	.221*
	Sig. (2-tailed)	.000	.080	.000	.837	.001	.211	.014		.000	.470	.029
	N	101	102	102	101	100	102	101	102	99	102	97
Hyperarousal	Pearson Correlation	-.410**	-.365**	.518**	.014	-.251*	.264**	.311**	-.437**	1	.072	-.300**
	Sig. (2-tailed)	.000	.000	.000	.891	.013	.008	.002	.000		.478	.003
	N	99	100	99	99	98	99	98	99	100	100	95
ERQ Suppresion	Pearson Correlation	-.279**	-.384**	.092	.075	-.048	.219*	.353**	-.072	.072	1	.047
	Sig. (2-tailed)	.004	.000	.359	.452	.636	.027	.000	.470	.478		.646
	N	102	103	102	102	100	102	101	102	100	103	98
AgeDiagBC Sclero	Pearson Correlation	.163	.026	-.248**	.045	-.049	-.082	-.056	.221*	-.300**	.047	1
	Sig. (2-tailed)	.091	.791	.009	.644	.623	.409	.575	.029	.003	.646	
	N	109	110	109	110	105	104	103	97	95	98	114

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix H						
Means and Standard Deviations for the Three Comparison Groups						
Group	Scleroderma		Community		Breast Cancer	
	Mean	SD	Mean	SD	Mean	SD
SHAQ	14.91	6.02	-		-	
Stress	12.16	3.70	11.46	2.78	11.95	3.98
Anxiety	11.00	3.09	8.54	1.59	9.91	2.31
Depression	11.59	4.78	9.49	2.63	11.82	5.37
EMWS	70.03	23.94	78.65	20.22	71.91	27.12
Dismissive Attachment	15.40	4.25	15.69	3.76	15.27	4.11
Fearful Attachment	9.23	3.68	9.42	3.01	11.59	4.66
Reappraisal	27.96	7.99	30.31	6.08	28.82	5.97
Suppression	14.51	5.56	13.60	4.53	14.59	5.37
Hyper-arousal Introspect	18.20	5.13	18.00	4.44	19.32	5.25
Hyper-arousal	73.64	15.92	71.42	13.82	74.91	15.36
Hyper-arousal Reactive	7.40	2.79	6.67	2.66	7.64	2.68
Self-Compassion	83.15	17.94	86.43	15.87	81.09	14.88
SC Isolation	13.21	3.90	14.00	3.63	12.68	3.70
SC Over Identify	15.10	3.54	13.22	3.41	12.64	3.80
SC Self Judgment	15.67	4.56	16.16	3.74	15.50	4.74
SC Self Kindness	13.61	4.80	15.81	4.46	14.32	3.91
SC Common Humanity	12.83	3.70	13.29	3.42	13.09	2.45
SC Mindfulness	12.81	3.36	13.95	2.95	12.86	2.70
Raynaud's	28.21	27.86	-	-	-	-
Breathing	19.66	25.20	-	-	-	-
Intestinal	19.58	23.37	-	-	-	-
Pain	28.48	26.10	-	-	25.00	25.89
Finger Ulcers	8.78	18.40	-	-	-	-